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PROPAGATION AND DISTRIBUTION OF FOOD FISHES

FISCAL YEAR 1925

Clemson University
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y GLEN C. LEACH

DEPARTMENT OF COMMERCE
Bureau of Fisheries Document No. 999

DEPARTMENT OF COMMERCE
BUREAU OF FISHERIES
HENRY O'MALLEY, Commissioner

PROPAGATION AND DISTRIBUTION OF FOOD FISHES

FISCAL YEAR 1925

By GLEN C. LEACH
Assistant in Charge, Division of Fish Culture

APPENDIX IX TO THE REPORT OF THE U. S. COMMISSIONER OF FISHERIES FOR 1925

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PROPAGATION AND DISTRIBUTION OF FOOD FISHES, FISCAL YEAR 1925[1]

By GLEN C. LEACH, *Assistant in Charge, Division of Fish Culture*

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INTRODUCTION

The development of a cooperative plan of fish rearing with fish and game associations throughout the country represents the chief change in the fish-cultural methods of the bureau in 1925. This work gives promise of largely increasing the production of fish of the larger fingerling sizes and of arousing the interest of anglers to extend greater assistance to Federal and State officials in the work of maintaining the supply of fish in our streams.

The output of eggs, fry, and fingerling fish was 5,301,862,500, as compared with 5,361,810,600 in the fiscal year 1924. The operation of the bureau's fish-cultural stations has been developed to a high standard of efficiency, and further development will depend upon a larger investment of funds to increase the working capacity of the stations. Only by such methods may the bureau hope to materially increase its output and keep pace with the growing demand for fish.

The demand for fish for stocking interior waters exceeded that of the preceding year to some extent and was much greater than the bureau could meet, especially with regard to the warm-water species. There has been no noteworthy increase in the activities of the various States, respecting the establishment of fish-cultural stations or the enlargement of their game-warden service.

The public demand is for larger fingerling fish for stocking purposes, but owing to shortage of funds and insufficient rearing facilities it has not been possible for the bureau to produce them in adequate numbers at its hatcheries. To meet this condition it was deemed essential to solicit the aid of fish and game organizations, and this was done by addressing a letter signed by the Secretary of Commerce, to such organizations throughout the country. In this letter the Secretary called attention to the ability of the organizations to render practical assistance to the Government in its efforts to produce fingerling fish for stocking public waters, especially such fishes as the black basses and crappie.

Numerous responses and offers of assistance were received from fishing clubs in different parts of the country, and as a result approximately 20 cooperative fish nurseries were placed in operation before the close of the fiscal year. Thus far their activities have been directed mainly to the rearing of small fingerling trout to a length of 4 or 5 inches before liberating them in open waters. Such work in the eastern sections of the country, notably in New York and Pennsylvania, has been begun on a very encouraging basis. As an illustration, the organization known as the Central Pennsylvania Fish and Game Protective Association, of Harrisburg, Pa., purchased a

16-acre tract of land containing a large spring, and constructed ponds with the view of holding and feeding until October the small trout turned over to them during the spring months by the bureau's hatcheries. In cases of this kind the bureau will inspect the projects at regular intervals during the summer, and will assume charge of the distribution of the fish in the fall of the year. The Texas and Blockhouse Fish and Game Association, Williamsport, Pa., was the first to undertake cooperative trout culture in the eastern part of the United States. The ponds and troughs of this organization were built under the supervision of the Bureau of Fisheries.

Judging from the information now at hand, it is probable that a number of cooperative nurseries will be established in the Southern States and in sections where warm-water pondfishes, especially the basses, are in great demand. The production of fingerling fish by this method will greatly lessen the dependence heretofore placed on the collection of rescued fishes from overflowed lands along the Mississippi River to supplement the general distributions. The facilities at the bureau's fish-cultural stations are too limited to meet the demands for the so-called warm-water fishes, and it is not considered good policy to draw heavily on the supply of fish salvaged from the upper Mississippi River for shipment to remote sections of the United States. It is the intention of the bureau to make each section self-supporting, so far as possible, in the production of indigenous fishes.

The bureau has pursued its formerly established policy with regard to the collection of food fishes from overflowed lands bordering the Mississippi River. In the prosecution of such work a great deal of State aid is given in salvaging the fish from landlocked pools and distributing them in interior waters. In this connection, the State conservation commissions of Illinois, Iowa, and Wisconsin have utilized their cars to remove fish from the bureau's retaining stations and plant them in suitable waters. Such assistance permits the bureau to expend a larger portion of its funds on the salvage work, and as its experienced personnel is able to devote more time to that branch of the operations, it can render much more efficient service than would otherwise be possible.

Under the act establishing the upper Mississippi wild life and fish refuge, approved June 7, 1924, certain overflowed lands in the upper Mississippi River district will be purchased by the Federal Government and set aside as natural hatcheries for the production of native fishes. The lakes included in this territory will be supervised by the fish-cultural force in that region and utilized in connection with the rescue operations. It is the eventual aim of the bureau to produce the entire stock of bass and other fishes needed for distribution to applicants and to return to the river all fish salvaged from the overflowed lands. It is probable that the adjacent States will aid in the project, not only in a police capacity but in the acquirement of additional land for its enlargement. The pursuance of such a policy will be of great benefit to the States, as it will mean the expansion of their conservation work.

The bureau has followed its usual custom with regard to placing spawn takers on the commercial fishing boats in the Great Lakes region to collect eggs of the whitefish, lake trout, and pike perch. The fishermen generally have cooperated in this work, and have

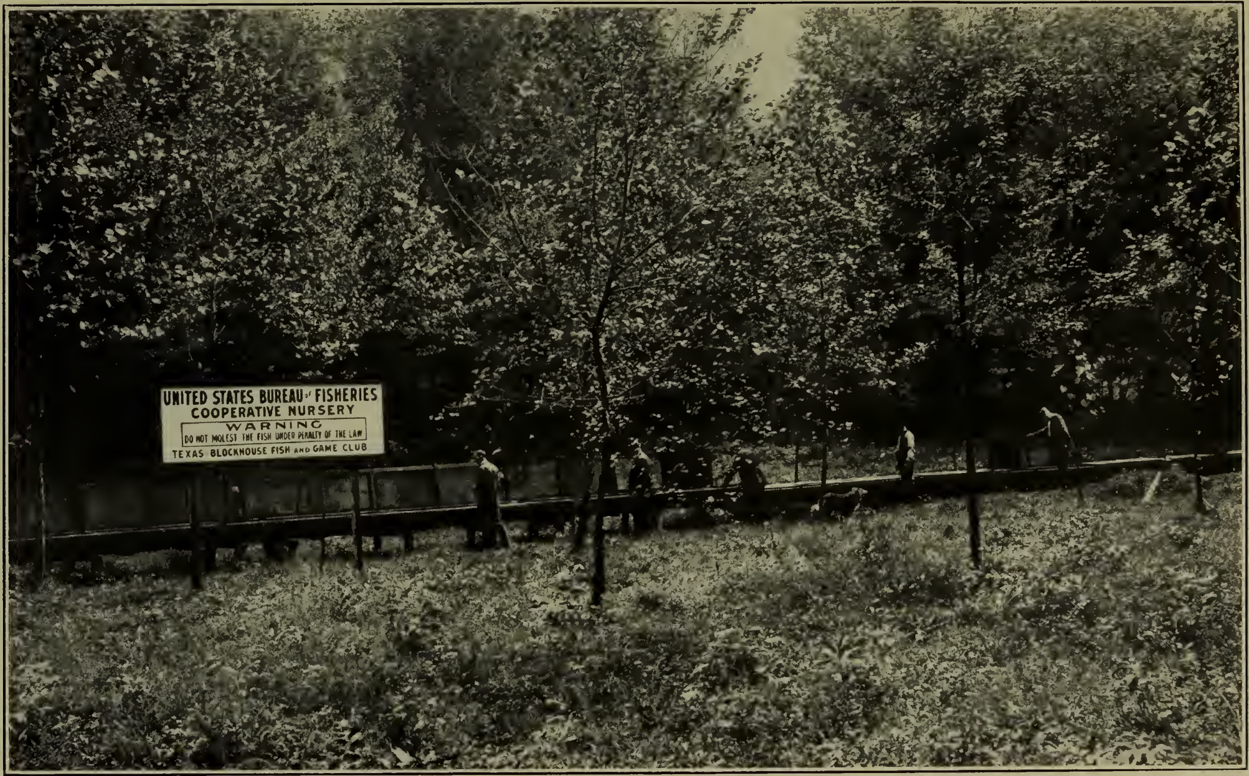
UNITED STATES BUREAU OF FISHERIES
COOPERATIVE NURSERY
WARNING
DO NOT MOLEST THE FISH UNDER PENALTY OF THE LAW
TEXAS BLOCKHOUSE FISH AND GAME CLUB

FIG. 1.—Cooperative trout culture Nursery troughs

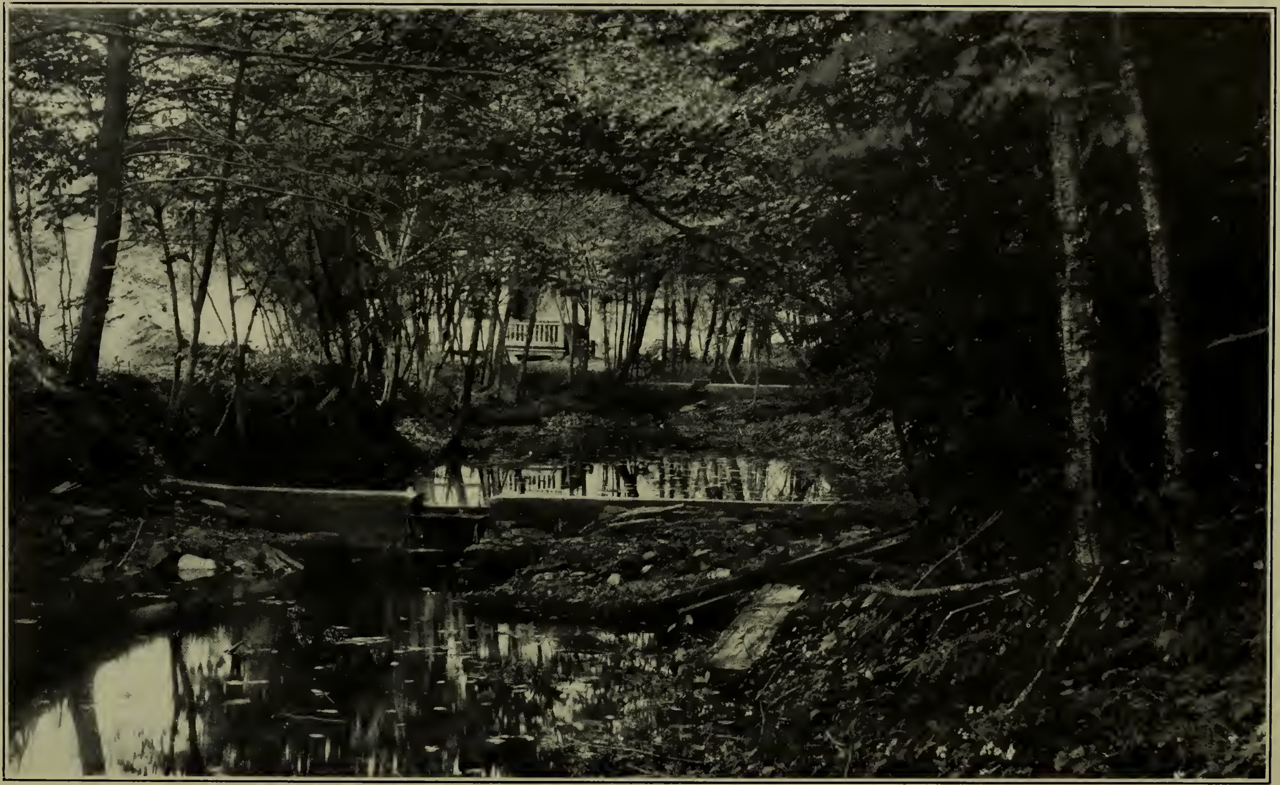

FIG. 2.—Cooperative trout culture. Nursery ponds

made it possible to conserve many millions of eggs which would otherwise have gone to market in the fish and been wasted. Besides assisting the bureau to collect the eggs, many of the fishermen have given the use of their boats during the spring months for the purpose of distributing the fry on suitable reefs on the natural spawning grounds.

Very unusual conditions were experienced at the Woods Hole (Mass.) station, in that it proved impossible to obtain a brood stock of cod as a source of egg supply. Cod failed to appear on their usual spawning grounds, and it was not considered feasible to charter a boat to transport brood fish from more remote fields to the hatchery. Under such conditions no cod eggs were available for propagation at this station.

As in past years, spawn takers were placed on the commercial fishing boats operating in fields at a considerable distance from shore during the spring months. Since these boats are absent from the home port for several days on each trip, all eggs thus collected must be fertilized and immediately returned to the native spawning grounds. The object of this work is to prevent the enormous waste of eggs which would otherwise result when dressing the fish for the market.

The bureau has continued its policy of refusing to issue countersigned permits allowing gill-net fishermen to fish for shad in the restricted territory above the railroad bridge at Edenton, N. C. It became apparent, from the small number of eggs obtained from the gill-net fishermen in former years, that greater results might be expected if the shad were permitted to spawn naturally. A number of gill-net and pound-net fishermen operating in other sections have cooperated with the bureau by furnishing considerable numbers of shad and herring eggs.

The decline of the shad in the Potomac River in recent years has been very marked, and it is evident that it will be necessary to enact and enforce very stringent legislation if this important fishery is to be maintained.

Part 1.—FISH PRODUCTION: PROPAGATION AND RESCUE WORK

TABULAR SUMMARIES OF OPERATIONS

SPECIES OF FISHES HANDLED

During the fiscal year 1925 the fish-cultural work of the bureau, including artificial propagation and rescue work, involved the handling of 48 species of fishes, as follows:

LIST OF SPECIES HANDLED

Catfishes (Siluridæ):
  Blue catfish (*Ictalurus furcatus*).
  Channel catfish (*Ictalurus punctatus*).
  Horned pout, bullhead (*Ameiurus nebulosus*).
  Mud catfish (*Leptops olivaris*).
Suckers (Catostomidæ):
  Common buffalo fish (*Ictiobus cyprinella*).
  Smallmouth buffalo fish (*Ictiobus bubalus*).
Carps (Cyprinidæ): German carp (*Cyprinus carpio*).

SHADS AND HERRINGS (CLUPEIDÆ):
  Shad (*Alosa sapidissima*).
  Glut herring (*Pomolobus æstivalis*).
SALMONS, TROUTS, WHITEFISHES, ETC. (SALMONIDÆ):
  Common whitefishes (*Coregonus albus* and *C. clupeaformis*).
  Cisco (*Argyrosomus artedi*).
  Chinook salmon, king salmon, quinnat salmon (*Oncorhynchus tschawytscha*).
  Chum salmon, dog salmon (*Oncorhynchus keta*).
  Humpback salmon, pink salmon (*Oncorhynchus gorbuscha*).
  Silver salmon, coho salmon (*Oncorhynchus kisutch*).
  Sockeye salmon, blueback salmon, redfish (*Oncorhynchus nerka*).
  Steelhead salmon (*Salmo gairdneri*).
  Atlantic salmon (*Salmo salar*).
  Landlocked salmon (*Salmo sebago*).
  Rainbow trout (*Salmo shasta*).
  Black-spotted trout, redthroat trout (*Salmo lewisi*).
  Loch Leven trout (*Salmo levenensis*).
  Lake trout, Mackinaw trout (*Cristivomer namaycush*).
  Brook trout (*Salvelinus fontinalis*).
  Brown trout (*Salmo fario*).
GRAYLINGS (THYMALLIDÆ): Montana grayling (*Thymallus montanus*).
PIKES (ESOCIDÆ): Common pickerel (*Esox lucius*).
SUNFISHES, BLACK BASSES, AND CRAPPIES (CENTRARCHIDÆ):
  Crappies (*Pomoxis annularis* and *P. sparoides*).
  Largemouth black bass (*Micropterus salmoides*).
  Smallmouth black bass (*Micropterus dolomieu*).
  Rock bass (*Ambloplites rupestris*).
  Warmouth bass, goggle-eye (*Chænobryttus gulosus*).
  Green sunfish (*Apomotis cyanellus*).
  Red-breasted bream (*Lepomis auritus*).
  Bluegill sunfish (*Lepomis pallidus*).
  Long-eared sunfish (*Lepomis megalotis*).
  Common sunfish (*Eupomotis gibbosus*).
PERCHES (PERCIDÆ):
  Pike perch (*Stizostedion vitreum*).
  Sauger (*Stizostedion canadense*).
  Yellow perch, ringed perch (*Perca flavescens*).
SEA BASSES (SERRANIDÆ): White bass (*Roccus chrysops*).
DRUMS (SCIÆNIDÆ): Fresh-water drum, lake sheepshead (*Aplodinotus grunniens*).
MACKEREL (SCOMBER LINNÆUS): Common mackerel (*Scomber scombrus*).
CODS (GADIDÆ):
  Cod (*Gadus callarias*).
  Haddock (*Melanogrammus æglifinus*).
  Pollock (*Pollachius virens*).
FLOUNDERS (PLEURONECTIDÆ): Winter flounder, American flatfish (*Pseudopleuronectes americanus*).

COOPERATION WITH STATES, OTHER FEDERAL AGENCIES, AND FOREIGN GOVERNMENTS

During the year the bureau exchanged eggs with the Dominion of Canada and supplied eggs to several European and South American countries. The exchanges made with the Canadian authorities have been of material advantage to the bureau, since it received in return eggs of the valuable Atlantic salmon. A number of the States have been supplied with fish and eggs in exchange for eggs of species which the bureau would otherwise have had to purchase. In many instances the States have agreed to incubate eggs and distribute the resulting fry without cost to the bureau, which will effect a material saving in the expense of handling such fish.

A large number of fish and game organizations have offered to contribute the use of ponds and lakes under their control for the purpose of rearing to a larger size the small fish which the bureau ordinarily distributes in the spring months, putting them out as fingerlings in September or October. This cooperative assistance will be a great aid to the bureau, and it is believed it will go far toward increasing the supply of fish life in the streams and lakes.

OUTPUT

The output of the fish-cultural stations and of the rescue fields bordering the Mississippi River aggregated 5,301,950,325 fish and fish eggs. Losses in transportation amounted to 87,742, leaving a net output of 5,301,862,583 actually distributed, which shows a falling off of approximately 60,000,000, as compared with last year's figures. Practically the entire production of the commercial fishes was returned to the waters in which the eggs originated.

Summary, by species, of the output of fish and fish eggs during the fiscal year ended June 30, 1925

Species	Eggs	Fry	Fingerlings	Total
Catfish			14, 310, 290	14, 310, 290
Buffalo fish	127, 400, 000	12, 562, 500	4, 261, 430	144, 223, 930
Carp		31, 500, 000	10, 959, 465	42, 459, 465
Shad		17, 158, 671		17, 158, 671
Glut herring		92, 000, 000		92, 000, 000
Whitefish	340, 000	172, 630, 000		172, 970, 000
Cisco	8. 000, 000	118, 900, 000		126, 900, 000
Chinook salmon	7, 504, 880	2, 528, 800	42, 684, 200	52, 717, 880
Chum salmon		16, 051, 650		16, 051, 650
Silver salmon	862, 000	10, 177, 650	3, 797, 639	14, 837, 289
Sockeye salmon	3, 150, 000	28, 070, 000	3, 891, 700	35, 111, 700
Humpback salmon		10, 892, 500		10, 892, 500
Steelhead salmon	604, 000	124, 580	1, 327, 184	2, 055, 764
Atlantic salmon		1, 410, 000	12, 500	1, 422, 500
Landlocked salmon	81, 000	816, 621	219, 825	1, 117, 446
Rainbow trout	3, 008, 754	1, 989, 500	2, 326, 485	7, 324, 739
Black-spotted trout	16, 802, 060	4, 776, 100	1, 584, 817	23, 162, 977
Loch Leven trout	8, 803, 000		784, 341	9, 587, 341
Lake trout	2, 940, 000	32, 822, 613	309, 815	36, 072, 428
Brook trout	500, 000	2, 776, 469	12, 755, 628	16, 032, 097
Silver trout			100, 000	100, 000
Grayling		4, 877, 000	29	4, 877, 029
Pike and pickerel			709, 077	709, 077
Mackerel		3, 517, 000		3, 517, 000
Crappie			16, 884, 251	16, 884, 251
Largemouth black bass		1, 135, 100	1, 615, 021	2, 750, 121
Smallmouth black bass		545, 400	41, 927	587, 327
Rock bass			60, 560	60, 560
Warmouth bass			5, 370	5, 370
Sunfish			13, 894, 947	13, 894, 947
Pike perch	122, 450, 000	116, 100, 000	141, 584	238, 691, 584
Yellow perch	5, 850, 000	83, 988, 800	555, 340	90, 394, 140
White bass			4, 425	4, 425
Fresh-water drum			19, 590	19, 590
Cod	598, 065, 000	462, 712, 000		1, 060, 777, 000
Haddock	139, 366, 000	24, 511, 000		163, 877, 000
Pollock		222, 890, 000		222, 890, 000
Winter flounder	4, 667, 000	2, 637, 051, 000		2, 641. 718, 000
Miscellaneous fishes			3, 696, 495	3, 696, 495
Total	1, 050, 393, 694	4, 114, 514, 954	136, 953, 935	5, 301, 862, 583

Assignments of fish eggs to State and Territorial fish commissions, fiscal year 1925

State and species	Number
Arizona:	
Black-spotted trout	200,000
Rainbow trout	220,000
California: Black-spotted trout	300,000
Colorado:	
Black-spotted trout	100,000
Lake trout	25,000
Rainbow trout	25,000
Connecticut: Loch Leven trout	50,000
Hawaii: Rainbow trout	50,000
Idaho:	
Black-spotted trout	175,000
Lake trout	100,000
Landlocked salmon	25,000
Rainbow trout	30,000
Steelhead salmon	46,000
Illinois:	
Black-spotted trout	25,000
Pike perch	37,800,000
Rainbow trout	170,000
Silver salmon	100,000
Steelhead salmon	25,000
Iowa: Rainbow trout	143,000
Maine: Lake trout	100,000
Maryland: Rainbow trout	277,980
Massachusetts: Loch Leven trout	50,000
Michigan:	
Cisco	8,000,000
Whitefish	200,000
Minnesota:	
Lake trout	500,000
Loch Leven trout	3,000,000
Missouri: Yellow perch	5,850,000
Montana:	
Black-spotted trout	1,485,000
Loch Leven trout	1,413,000
New Hampshire:	
Chinook salmon	450,000
Lake trout	75,000
Landlocked salmon	20,700
Pike perch	500,000
New Jersey: Loch Leven trout	500,000
New Mexico:	
Rainbow trout	117,000
Steelhead salmon	50,000
New York:	
Black-spotted trout	10,000
Lake trout	515,000
Whitefish	140,000
North Carolina: Rainbow trout	588,430
Oregon:	
Black-spotted trout	2,000,000
Chinook salmon	7,044,880
Loch Leven trout	2,185,000
Silver salmon	762,000
Sockeye salmon	3,000,000
Pennsylvania:	
Lake trout	50,000
Loch Leven trout	300,000
Pike perch	84,150,000
Utah: Lake trout	250,000
Washington: Black-spotted trout	2,000,000
Wisconsin: Lake trout	500,000
Wyoming:	
Black-spotted trout	425,000
Loch Leven trout	500,000
Rainbow trout	350,000
Steelhead salmon	50,000
Total	167,017,990

Shipments of fish and fish eggs to foreign countries and the Canal Zone, fiscal year 1925

Country and species	Number of eggs	Number of fish
Canada:		
Lake trout	500,000	
Loch Leven trout	500,000	
Canal Zone:		
Largemouth black bass		2,250
Bream		500
Crappie		500
Colombia: Loch Leven trout	50,000	
Netherlands: Rainbow trout	50,000	
Panama: Rainbow trout	25,000	
Total	1,125,000	3,250

EGG COLLECTIONS

The commercial fisheries of the Atlantic coast and the Great Lakes are the principal sources of supply for eggs for the bureau's work. Vast numbers of the eggs available in these fields would be wasted were it not for the efforts put forth by the bureau to conserve them. In some cases the eggs are planted on the spawning grounds immediately after fertilization is accomplished, but whenever conditions make it possible they are transferred to hatcheries, incubated, and the resulting fry liberated on suitable spawning grounds in the region in which the eggs were taken.

As compared with the statement of the preceding year, the records of last year show a slight increase in the total number of eggs collected, the most important increases being among the pike perch, cod, and winter flounder.

Comparison of egg collections, fiscal years 1925 and 1924

Species	1925	1924	Species	1925	1924
Buffalo fish	140, 400, 000	376, 778, 500	Brown trout	31, 000	
Carp	44, 875, 000	55, 325, 000	Lake trout	66, 908, 500	78, 016, 233
Shad	26, 772, 000	16, 452, 000	Brook trout	19, 684, 794	18, 488, 304
Glut herring	336, 700, 000	222, 740, 000	Grayling	917, 000	
Whitefish	252, 925, 000	481, 018, 000	Smelt		18, 000, 000
Cisco	187, 800, 000	200, 790, 000	Mackerel	3, 821, 000	
Chinook salmon	54, 437, 000	55, 474, 800	Pike perch	416, 640, 000	333, 875, 000
Chum salmon	17, 110, 000	25, 344, 700	Sauger		8, 400, 000
Humpback salmon		1, 573, 000	Yellow perch	116, 460, 000	224, 780, 000
Silver salmon	11, 578, 000	22, 722, 000	Cod	1, 356, 823, 000	1, 002, 814, 000
Sockeye salmon	64, 465, 000	46, 688, 000	Haddock	216, 825, 000	239, 610, 000
Steelhead salmon	4, 174, 969	6, 031, 164	Pollock	430, 648, 000	401, 824, 000
Landlocked salmon	1, 263, 000	1, 298, 600	Winter flounder	2, 882, 065, 000	2, 404, 887, 000
Rainbow trout	13, 914, 384	11, 433, 217			
Black-spotted trout	26, 030, 000	39, 859, 500	Total	6, 705, 428, 297	6, 302, 143, 468
Loch Leven trout	12, 160, 650	7, 920, 050			

FISH-RESCUE WORK

Salvage operations in the Mississippi Valley were greatly curtailed owing to the abnormally high water stages which prevailed in the Mississippi River during the greater part of the summer and fall. The territory covered by the work extended from Prescott, Wis., on the north, to Andalusia, Ill., on the south, and the following table shows the results accomplished:

Number and disposition of fish rescued fiscal year 1925

Locality and species	Delivered to applicants	Restored to original waters	Total number of fish rescued
Homer, Minn.:			
Black bass	57, 380	129, 170	186, 550
Bream	163, 060	8, 972, 740	9, 135, 800
Buffalo fish		95, 250	95, 250
Carp		3, 438, 020	3, 438, 020
Catfish	44, 900	2, 889, 820	2, 934, 720
Crappie	239, 750	8, 506, 200	8, 745, 950
Fresh-water drum		14, 950	14, 950
Pike perch	30	141, 260	141, 290
White bass		1, 870	1, 870
Yellow perch	18, 400	167, 010	185, 400
Miscellaneous	1, 450	93, 490	94, 940
Total	524, 970	24, 449, 780	24, 974, 750
La Crosse, Wis.:			
Black bass	81, 910	9, 120	91, 030
Bream	12, 960	1, 499, 530	1, 512, 490
Buffalo fish		698, 000	698, 000
Carp		2, 024, 500	2, 024, 500
Catfish	35, 800	3, 176, 450	3, 212, 250
Crappie	29, 640	1, 864, 040	1, 893, 680
Fresh-water drum		5, 000	5, 000
Pike and pickerel		469, 400	469, 400
White bass		2, 100	2, 100
Yellow perch	4, 130	251, 980	256, 110
Miscellaneous		1, 115, 500	1, 115, 500
Total	164, 440	11, 115, 620	11, 280, 060
Lynxville, Wis.:			
Black bass	2, 270	5, 440	7, 710
Bream	5, 380	527, 430	532, 810
Buffalo fish		150, 590	150, 590
Carp		1, 948, 100	1, 948, 100
Catfish	13, 690	2, 775, 460	2, 789, 150
Crappie	23, 350	1, 831, 980	1, 855, 330
Pike and pickerel		91, 670	91, 670
Yellow perch	1, 350	62, 080	63, 430
Miscellaneous		186, 950	186, 950
Total	46, 040	7, 579, 700	7, 625, 740

Number and disposition of fish rescued fiscal year 1925—Continued

Locality and species	Delivered to applicants	Restored to original waters	Total number of fish rescued
Marquette, Iowa:			
Black bass	22,810	23,680	46,490
Bream	7,600	1,353,100	1,360,700
Buffalo fish		644,480	644,480
Carp		688,450	688,450
Catfish		3,451,200	3,451,200
Crappie	3,330	1,505,580	1,508,910
Pike and pickerel		53,510	53,510
Yellow perch	780	46,200	46,980
Miscellaneous		586,800	586,800
Total	34,520	8,353,000	8,387,520
Bellevue, Iowa:			
Black bass	8,720	1,790	10,510
Bream	49,060	119,450	168,510
Buffalo fish	20	1,844,990	1,845,010
Carp	130	1,824,880	1,825,010
Catfish	27,320	841,980	869,300
Crappie	55,060	742,650	797,710
Pike and pickerel	20	1,590	1,610
White bass		340	340
Yellow perch	1,070	310	1,380
Miscellaneous	100	824,900	825,000
Total	141,500	6,202,880	6,344,380
Rock Island, Ill.:			
Black bass		8,500	8,500
Bream		491,000	491,000
Buffalo fish		229,600	229,600
Carp		352,400	352,400
Catfish		325,500	325,500
Crappie		1,711,000	1,711,000
Pike and pickerel		11,750	11,750
White bass		900	900
Miscellaneous		478,000	478,000
Total		3,608,650	3,608,650
Fairport, Iowa:			
Black bass		13,150	13,150
Bream	20,940	59,700	80,640
Buffalo fish		18,580	18,580
Carp		32,000	32,000
Catfish		23,920	23,920
Crappie	1,620	106,910	108,530
Pike and pickerel		80	80
White bass		30	30
Miscellaneous		5,710	5,710
Total	22,560	260,080	282,640
Atchafalaya, La.:			
Black bass	3,300	2,480	5,780
Bream	2,130	96,270	98,400
Buffalo fish		579,600	579,600
Carp		651,000	651,000
Catfish		675,000	675,000
Crappie		227,300	227,300
Pike and pickerel		1,000	1,000
White bass		100	100
Yellow perch		100	100
Miscellaneous		403,600	403,600
Total	5,430	2,636,450	2,641,880

STATIONS AND SUBSTATIONS AND OUTPUT OF EACH

During the fiscal year 1925 fish-cultural work was conducted at 36 stations, 38 substations, and a considerable number of egg-collecting stations, the latter being in operation only during the spawning season of the various fishes handled. The following table lists the stations in alphabetical order with their auxiliary substations immediately following each. The output of fish and fish eggs from each station for the year is also shown.

Stations and substations operated and output of each, fiscal year 1925

(Asterisk (*) denotes transfer of eggs. See table, p. 454)

Stations, substations, and species	Eggs	Fry	Fingerlings, yearlings, and adults	Total
Baird, Calif.: Chinook salmon		300, 000	833, 500	1, 133, 500
Battle Creek, Calif.: Chinook salmon		250, 000	1, 059, 000	1, 309, 000
Mill Creek, Calif.: Chinook salmon	(*)	1, 598, 800		1, 598, 800
Baker Lake, Wash.: Sockeye salmon	(*)	20, 770, 000		20, 770, 000
Birdsview, Wash.:				
Humpback salmon		1, 134, 000		1, 134, 000
Silver salmon	100, 000	2, 845, 000	740, 000	3, 685, 000
Sockeye salmon	150, 000			150, 000
Steelhead salmon	* 100, 000		418, 000	518, 000
Duckabush, Wash.:				
Chinook salmon			497, 000	497, 000
Chum salmon		12, 310, 500		12, 310, 500
Humpback salmon		4, 390, 000		4, 390, 000
Silver salmon		2, 093, 400		2, 093, 400
Steelhead salmon			90, 400	90, 400
Quilcene, Wash.:				
Chinook salmon			465, 200	465, 200
Chum salmon		3, 741, 150		3, 741, 150
Humpback salmon		5, 368, 500		5, 368, 500
Silver salmon		3, 911, 250	746, 639	4, 657, 889
Steelhead salmon		50, 000	117, 875	167, 875
Sultan, Wash.:				
Chinook salmon		380, 000	198, 000	578, 000
Silver salmon		454, 000	230, 000	684, 000
Steelhead salmon			83, 000	83, 000
Berkshire trout hatchery, Mass.:				
Brook trout			85, 200	85, 200
Pike perch		400, 000		400, 000
Rainbow trout			54, 100	54, 100
Smallmouth black bass			640	640
Boothbay Harbor, Me.: Winter flounder		1, 884, 436, 000		1, 884, 436, 000
Bozeman, Mont.:				
Black-spotted trout	310, 000	956, 000	517, 017	1, 783, 017
Brook trout			1, 074, 840	1, 074, 840
Catfish			60	60
Grayling			29	29
Lake trout			9, 100	9, 100
Loch Leven trout	598, 000		155, 511	735, 511
Rainbow trout		311, 000	12, 000	323, 000
Glacier Park, Mont.:				
Black-spotted trout	245, 800	75, 000	155, 000	475, 800
Rainbow trout		342, 000		342, 000
Meadow Creek, Mont.:				
Black-spotted trout		41, 000		41, 000
Grayling		4, 877, 000		4, 877, 000
Loch Leven trout	* 8, 200, 000			8, 200, 000
Rainbow trout	* 230, 000	1, 308, 000		1, 538, 000
Cape Vincent, N. Y.:				
Brook trout		581, 500	19, 400	600, 900
Cisco	*8, 000, 000	118, 500, 000		126, 500, 000
Lake trout		265, 000		265, 000
Landlocked salmon		6, 000		6, 000
Pike perch		5, 900, 000		5, 900, 000
Rainbow trout		30, 500		30, 500
Smallmouth black bass			95	95
Whitefish	*140, 000	36, 500, 000		36, 640, 000
Yellow perch		3, 900, 000		3, 900, 000
Swanton, Vt.:				
Pike perch	*84, 650, 000	33, 000, 000		117, 650, 000
Smallmouth black bass			57	57
Yellow perch	(*)	24, 700, 000		24, 700, 000
Central station, Washington, D. C.:				
Black bass			938	938
Brook trout			111, 800	111, 800
Cisco		400, 000		400, 000
Rainbow trout			19, 000	19, 000
Whitefish		200, 000		200, 000
Yellow perch	5, 850, 000			5, 850, 000
Bryans Point, Md.:				
Largemouth black bass			25	25
Shad		16, 678, 671		16, 678, 671
Yellow perch	(*)	34, 420, 800	370	34, 421, 170
Lakeland, Md.:				
Black bass			47, 376	47, 376
Brook trout			24	24
Catfish			123	123
Crapple			14, 595	14, 595
Rainbow trout			150	150
Rock bass			6, 900	6, 900
Sunfish			43, 115	43, 115

Stations and substations operated and output of each, fiscal year 1925—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings, yearlings, and adults	Total
Clackamas, Oreg.:				
Brook trout			36,000	36,000
Chinook salmon			7,278,000	7,278,000
Silver salmon	237,000			237,000
Silver trout			100,000	100,000
Steelhead salmon	200,000		24,000	224,000
Applegate, Oreg.: Silver salmon	(*)		1,495,000	1,495,000
Big White Salmon, Wash.: Chinook salmon	4,969,880		9,138,800	14,108,680
Little White Salmon, Wash.:				
Brook trout			122,000	122,000
Chinook salmon	*2,525,000		15,047,000	17,572,000
Rogue River, Oreg.:				
Chinook salmon			3,066,200	3,066,200
Landlocked salmon			9,100	9,100
Silver salmon	525,000		586,000	1,111,000
Sockeye salmon			46,700	46,700
Steelhead salmon	*249,000		450,000	699,000
Sandy River, Oreg.:				
Chinook salmon			959,000	959,000
Steelhead salmon	*58,000			58,000
Snake River, Oreg.:				
Chinook salmon			4,142,500	4,142,500
Rainbow trout			100,800	100,800
Cold Spring, Ga.:				
Largemouth black bass		170,100	230,395	400,495
Catfish			4,400	4,400
Sunfish			75,250	75,250
Harris Pond, Ga.:				
Catfish			3,300	3,300
Sunfish			29,850	29,850
Craig Brook, Me.:				
Atlantic salmon		1,410,000	12,500	1,422,500
Brook trout		671,000	355,550	1,026,550
Lake trout		5,500	25,100	30,600
Landlocked salmon	*81,000	528,205	53,725	662,930
Smallmouth black bass			55	55
Grand Lake Stream, Me.: Landlocked salmon	(*)	273,250		273,250
Green Lake, Me.: Landlocked salmon	(*)		134,200	134,200
Duluth, Minn.:				
Brook trout			189,000	189,000
Lake trout	*1,475,000	12,555,000	197,500	14,227,500
Pike perch		13,000,000		13,000,000
Steelhead salmon			29,000	29,000
Whitefish		1,100,000		1,100,000
Edenton, N. C.:				
Largemouth black bass		129,000	26,450	155,450
Crappie			316	316
Glut herring		92,000,000		92,000,000
Shad		480,000		480,000
Sunfish			9,625	9,625
Yellow perch		1,000,000	501	1,000,501
Erwin, Tenn.:				
Largemouth black bass		71,250	2,225	73,475
Brook trout			386,750	386,750
Loch Leven trout			8,530	8,530
Rainbow trout	210,000		155,712	365,712
Rock bass			18,400	18,400
Smallmouth black bass			225	225
Steelhead salmon			27,859	27,859
Sunfish			9,788	9,788
Fairport, Iowa:				
Largemouth black bass			13,151	13,151
Buffalo fish			18,925	18,925
Carp			32,000	32,000
Catfish			23,917	23,917
Crappie			108,585	108,585
Pike and pickerel			78	78
Sunfish			80,637	80,637
White bass			25	25
Miscellaneous			5,710	5,710
Gloucester, Mass.:				
Cod	*598,065,000	462,712,000		1,060,777,000
Haddock	139,366,000	24,511,000		163,877,000
Pollock		222,890,000		222,890,000
White flounder		174,323,000		174,323,000

Stations and substations operated and output of each, fiscal year 1925—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings, yearlings, and adults	Total
Homer, Minn.:				
Largemouth black bass			186,550	186,550
Buffalo fish			95,245	95,245
Carp			3,438,015	3,438,015
Catfish			2,934,710	2,934,710
Crappie			8,745,950	8,745,950
Fresh-water drum			14,590	14,590
Pike perch			141,285	141,285
Pike and pickerel			80,079	80,079
Rainbow trout			60,500	60,500
Sunfish			9,135,800	9,135,800
White bass			1,865	1,865
Yellow perch			185,405	185,405
Miscellaneous			94,935	94,935
Atchafalaya, La.:				
Largemouth black bass			5,575	5,575
Buffalo fish	127,400,000	12,562,500	579,600	140,542,100
Carp			651,000	651,000
Catfish			675,000	675,000
Crappie			227,300	227,300
Pike and pickerel			995	995
Sunfish			98,400	98,400
White bass			100	100
Yellow perch			100	100
Miscellaneous			403,600	403,600
Bellevue, Iowa:				
Largemouth black bass			8,495	8,495
Buffalo fish			1,845,000	1,845,000
Carp			1,825,000	1,825,000
Catfish			869,300	869,300
Crappie			797,700	797,700
Pike perch			299	299
Pike and pickerel			1,605	1,605
Sunfish			168,510	168,510
White bass			335	335
Yellow perch			1,375	1,375
Miscellaneous			825,000	825,000
Chicago, Ill.: Rainbow trout			40,500	40,500
La Crosse, Wis.:				
Largemouth black bass			91,030	91,030
Brook trout			643,800	643,800
Buffalo fish			698,000	698,000
Carp			2,024,500	2,024,500
Catfish			3,212,250	3,212,250
Crappie			1,893,675	1,893,675
Fresh-water drum			5,000	5,000
Loch Leven trout			59,300	59,300
Pike and pickerel			469,400	469,400
Rainbow trout			147,100	147,100
Sunfish			1,512,485	1,512,485
White bass			2,100	2,100
Yellow perch			256,100	256,100
Miscellaneous			1,115,500	1,115,500
Lynxville, Wis.:				
Largemouth black bass			7,705	7,705
Buffalo fish			150,585	150,585
Carp			1,948,100	1,948,100
Catfish			2,789,150	2,789,150
Crappie			1,855,325	1,855,325
Pike and pickerel			91,665	91,665
Sunfish			532,800	532,800
Yellow perch			63,425	63,425
Miscellaneous			186,950	186,950
Marquette, Iowa:				
Largemouth black bass			46,485	46,485
Buffalo fish			644,475	644,475
Carp			688,450	688,450
Catfish			3,451,200	3,451,200
Crappie			1,508,900	1,508,900
Pike and pickerel			53,510	53,510
Sunfish			1,360,700	1,360,700
Yellow perch			46,975	46,975
Miscellaneous			586,800	586,800
Rock Island, Ill.:				
Largemouth black bass			8,495	8,495
Buffalo fish			229,600	229,600
Carp			352,400	352,400
Catfish			325,500	325,500
Crappie			1,711,000	1,711,000
Pike and pickerel			11,745	11,745
Sunfish			491,000	491,000
Miscellaneous			478,000	478,000
Yellowstone, Wyo.: Black-spotted trout	*16,246,260	3,710,100		19,956,360

Stations and substations operated and output of each, fiscal year 1925—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings, yearlings, and adults	Total
Leadville, Colo.:				
Black-spotted trout			801,000	801,000
Brook trout	*500,000	400,000	4,503,500	5,403,500
Lake trout			57,000	57,000
Loch Leven trout			42,500	42,500
Rainbow trout			19,000	19,000
Steelhead trout			23,500	23,500
Louisville, Ky.:				
Black bass			4,650	4,650
Rock bass			525	525
Smallmouth black bass		420,000	2,725	2,725
Sunfish			16,700	16,700
Mammoth Spring, Ark.:				
Largemouth black bass			77,135	77,135
Catfish			700	700
Crappie			1,500	1,500
Rock bass			13,850	13,850
Smallmouth black bass		16,000	12,300	28,300
Sunfish			13,950	13,950
Manchester, Iowa:				
Brook trout			535,000	535,000
Catfish			300	300
Rainbow trout	*615,500		141,904	757,404
Rock bass			7,000	7,000
Smallmouth black bass			500	500
Sunfish			600	600
Nashua, N. H.:				
Brook trout			358,335	358,335
Lake trout			3,500	3,500
Landlocked salmon			20,000	20,000
Loch Leven trout			1,200	1,200
Pike perch		660,000		
Rainbow trout			87,850	87,850
Smallmouth black bass		28,400		28,400
Neosho, Mo.:				
Largemouth black bass			57,535	57,535
Catfish			4,050	4,050
Crappie			11,575	11,575
Rainbow trout	*312,000		96,613	96,613
Rock bass			3,450	3,450
Sunfish			75,462	75,462
Yellow perch			1,044	1,044
Bourbon, Mo.: Rainbow trout	747,354		59,445	806,799
Langdon, Kans.:				
Largemouth black bass			15,690	15,690
Catfish			5,525	5,525
Crappie			7,680	7,680
Rock bass			2,050	2,050
Sunfish			46,900	46,900
Yellow perch			45	45
Northville, Mich.:				
Brook trout		290,000	731,920	1,021,920
Rainbow trout			117,800	117,800
Smallmouth black bass		75,000	25,300	100,300
Sunfish			220	220
Alpena, Mich.:				
Lake trout	50,000	3,827,000		3,877,000
Whitefish	200,000	8,750,000		8,950,000
Charlevoix, Mich.:				
Lake trout	*1,415,000	16,000,000		17,415,000
Landlocked salmon		10,000		10,000
Steelhead salmon		35,500		35,500
Whitefish		17,000,000		17,000,000
Orangeburg, S. C.:				
Largemouth black bass		107,500	265,055	372,555
Catfish			225	225
Crappie			200	200
Sunfish			10,815	10,815
Warmouth bass			1,855	1,855
Put in Bay, Ohio:				
Carp		31,500,000		31,500,000
Pike perch	37,800,000	63,140,000		100,940,000
Smallmouth black bass			30	30
Whitefish		109,080,000		109,080,000
Yellow perch	(*)	19,968,000		19,968,000
Quinault, Wash.:				
Brook trout			24,900	24,900
Chinook salmon	* 10,000			10,000
Silver salmon		874,000		874,000
Sockeye salmon	3,000,000	1,000,000	2,845,000	6,845,000

Stations and substations operated and output of each, fiscal year 1925—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings, yearlings, and adults	Total
St. Johnsbury, Vt.:				
Brook trout		527, 500		527, 500
Lake trout		87, 500		87, 500
Landlocked salmon		10, 426	2, 800	13, 226
Rainbow trout			500	500
Steelhead salmon		11, 000	6, 200	17, 200
Holden, Vt.:				
Brook trout		177, 500		177, 500
Lake trout		82, 613	19, 100	101, 713
Landlocked salmon		11, 240		11, 240
York Pond, Vt.:				
Brook trout		129, 969	14, 133	144, 102
Lake trout			165	165
San Marcos, Tex.:				
Largemouth black bass			224, 861	224, 861
Catfish			8, 140	8, 140
Crappie			260	260
Rock bass			85	85
Steelhead salmon			2, 800	2, 800
Sunfish			38, 945	38, 945
Warmouth bass			3, 015	3, 015
Kerr County bass hatchery, Tex.:				
Largemouth black bass			19, 675	19, 675
Sunfish			40, 000	40, 000
Medina Lake, Tex.: Largemouth black bass			22, 237	22, 237
New Braunfels, Tex.:				
Largemouth black bass			36, 473	36, 473
Crappie			500	500
Sunfish			25, 000	25, 000
Warmouth bass			500	500
Saratoga, Wyo.:				
Black-spotted trout			60, 000	60, 000
Brook trout			525, 500	525, 500
Loch Leven trout			34, 000	34, 000
Rainbow trout			156, 000	156, 000
Lost Creek, Wyo.: Rainbow trout	*416, 150			416, 150
Spearfish, S. Dak.:				
Brook trout			874, 600	874, 600
Loch Leven trout			353, 400	353, 400
Rainbow trout			87, 700	87, 700
Steelhead salmon			54, 600	54, 600
Springville, Utah:				
Black-spotted trout			56, 000	56, 000
Brook trout	(*)		375, 400	375, 400
Catfish			600	600
Rainbow trout	*20, 000		450, 050	450, 050
Tupelo, Miss.:				
Largemouth black bass		430, 000	137, 205	567, 205
Catfish			600	600
Crappie			300	300
Rock bass			300	300
Sunfish			73, 375	73, 375
White Sulphur Springs, W. Va.:				
Largemouth black bass			66, 840	66, 840
Brook trout			1, 418, 694	1, 418, 694
Loch Leven trout	5, 000		133, 350	138, 350
Rainbow trout	*256, 550		401, 545	658, 095
Rock bass			6, 000	6, 000
Smallmouth black bass		6, 000		6, 000
Woods Hole, Mass.:				
Mackerel		3, 517, 000		3, 517, 000
Steelhead salmon		28, 080		28, 080
Winter flounder	4, 667, 000	578, 292, 000		582, 959, 000
Wytheville, Va.:				
Largemouth black bass		229, 000	21, 860	250, 860
Brook trout			387, 000	387, 000
Catfish			1, 250	1, 250
Loch Leven trout			750	750
Rainbow trout	201, 200		129, 600	330, 800
Rock bass			2, 000	2, 000
Sunfish			7, 100	7, 100
Yes Bay, Alaska: Sockeye salmon		6, 300, 000	1, 000, 000	7, 300, 000
Gross output	1, 050, 396, 694	4, 114, 548, 204	137, 005, 427	5, 301, 950, 325
Loss in transit	3, 000	33, 250	51, 492	87, 742
Net output	1, 050, 393, 694	4, 114, 514, 954	136, 953, 935	5, 301, 862, 583

TRANSFERS OF EGGS BETWEEN STATIONS

Large numbers of eggs are transferred annually between various stations of the bureau. In every instance such transfers are made in the interest of economy and convenience in the distribution of the product.

Transfer of eggs between stations, fiscal year 1925

Species	Number of eggs	From—	To—
Black-spotted trout	2,588,000	Yellowstone Park, Wyo	Bozeman, Mont.
	484,000	do	Glacier Park, Mont.
	814,000	do	Leadville, Colo.
	300,000	do	Saratoga, Wyo.
Brook trout	500,000	Leadville, Colo	Spearfish, S. Dak.
	500,000	do	Bozeman, Mont.
	500,000	do	Manchester, Iowa.
	100,000	do	Clackamas, Oreg.
	500,000	Springville, Utah	Bozeman, Mont.
Chinook salmon	500,000	Mill Creek, Calif	Battle Creek, Calif.
	1,000,000	Little White Salmon, Wash	Puget Sound stations.
	3,057,000	do	Clackamas, Oreg.
	2,217,600	Upper Clackamas, Oreg	Do.
	13,000	Quinault, Wash	Central Station, Washington, D. C.
Cisco	720,000	Cape Vincent, N. Y	Do.
Cod	1,750,000	Gloucester, Mass	Woods Hole, Mass.
Lake trout	15,000	Grand Lake Stream, Me	Craig Brook, Me.
	75,000	Duluth, Minn	Leadville, Colo.
	15,000	Charlevoix, Mich	Craig Brook, Me.
	200,000	do	Cape Vincent, N. Y.
Landlocked salmon	11,000	Craig Brook, Me	Charlevoix, Mich.
	25,000	do	St. Johnsbury, Vt.
	10,300	do	Cape Vincent, N. Y.
	10,300	do	Bozeman, Mont.
	22,600	do	Nashua, N. H.
	501,000	Grand Lake Stream, Me	Craig Brook, Me.
	142,500	Green Lake, Me	Do.
Loch Leven trout	150,000	Meadow Creek, Mont	White Sulphur Springs, W. Va.
	100,000	do	La Crosse, Wis.
	300,000	do	Spearfish, S. Dak.
	1,393,000	do	Bozeman, Mont.
Pike perch	11,000,000	Swanton, Vt	Cape Vincent, N. Y.
	1,000,000	do	Nashua, N. H.
	500,000	do	Berkshire, Mass.
Rainbow trout	25,000	Meadow Creek, Mont	Erwin, Tenn.
	25,000	do	Manchester, Iowa.
	1,297,000	do	Bozeman, Mont.
	551,000	do	Glacier Park, Mont.
	25,000	do	Salmon, Idaho.
	75,000	Manchester, Iowa	La Crosse, Wis.
	321,000	Neosho, Mo	Do.
	63,000	do	Spearfish, S. Dak.
	28,000	Lost Creek, Wyo	San Marcos, Tex.
	52,920	do	Spearfish, S. Dak.
	75,600	do	Neosho, Mo.
	33,150	do	Leadville, Colo.
	50,160	do	Saratoga, Wyo.
	25,000	Springville, Utah	Wytheville, Va.
	25,000	do	Leadville, Colo.
	50,000	White Sulphur Springs, W. Va.	Berkshire, Mass.
	53,000	do	Nashua, N. H.
Silver salmon	1,329,000	Baker Lake, Wash	Birdsview, Wash.
	237,000	Applegate, Oreg	Clackamas, Oreg.
Sockeye salmon	200,000	Baker Lake, Wash	Birdsview, Wash.
Steelhead salmon	100,000	Birdsview, Wash	Underwood, Wash.
	95,000	Applegate, Oreg	Little White Salmon, Wash.
	232,000	do	Clackamas, Oreg.
	100,000	do	Leadville, Colo.
	50,000	do	Woods Hole, Mass.
	40,000	do	San Marcos, Tex.
	40,000	do	Charlevoix, Mich.
	25,000	Rogue River, Oreg	Mammoth Spring, Ark.
	45,000	Sandy River, Oreg	Duluth, Minn.
Whitefish	280,000	Cape Vincent, N. Y	Central Station, Washington, D. C.
Yellow perch	5,850,000	Bryans Point, Md	Do.
	6,000,000	Put in Bay, Ohio	Mammoth Spring, Ark.
	4,000,000	Swanton, Vt	Cape Vincent, N. Y.

EGG COLLECTING AT AUXILIARY STATIONS

The eggs incubated at the main stations and substations of the bureau are very often transferred from auxiliary collecting stations, which are located as near as possible to the base of egg supply. Such stations are usually temporary in character and are occupied only while egg collecting is in progress. The following table shows the egg-collecting stations, the main stations under which they are operated, the period of operation, and the species handled.

Egg-collecting stations

Station	Period of operation	Species handled
Boothbay Harbor, Me.:		
Casco Bay, Me	Mar. 1–Apr. 30	Winter flounder.
Sheepscot River, Me	do	Do.
Linekins Bay, Me	do	Do.
Johns Bay, Me	do	Do.
Wheelers Bay, Me	do	Do.
Seal Harbor, Me	do	Do.
Ebencook Harbor, Me	do	Do.
Townsend Gut, Me	do	Do.
Pig Cove, Me	do	Do.
Mill Cove, Me	do	Do.
Bozeman, Mont.: Mystic Lake, Mont	Apr. 30–June 16	Rainbow trout.
Cape Vincent, N. Y.:		
Stony Island, N. Y	Oct. 18–Nov. 10	Lake trout.
Pigeon Island, Ontario	Oct. 18–Nov. 9	Do.
Charity Shoals	do	Do.
Chaumont Bay, N. Y	Nov. 15–Dec. 1	Whitefish.
Do	Nov. 20–Dec. 5	Cisco.
Do	Apr. 1–May 20	Yellow perch.
Port Hope, Ontario	Nov. 5–20	Whitefish.
Cobourg, Ontario	do	Do.
Brighton, Ontario	do	Do.
Wellers Bay, Ontario	Nov. 16–30	Cisco.
Fair Haven Bay, N. Y	Nov. 17–Dec. 5	Do.
Sodus Bay, N. Y	Nov. 17–Dec. 3	Do.
Craig Brook, Me.:		
Dennysville, Me	Sept. 1–30	Humpback salmon.
Toddy Pond, Me	Oct. 25–Nov. 18	Landlocked salmon.
Craig Pond, Me	Oct. 20–Nov. 15	Brook trout.
Grand Lake, Me	Oct. 20–Nov. 4	Lake trout.
Duluth, Minn.:		
Marquette, Mich	Oct. 18–Nov. 6	Do.
Au Train, Mich	do	Do.
Munising, Mich	Oct. 18–Nov. 7	Do.
Ontonagon, Mich	do	Do.
Big Traverse Bay, Mich	do	Do.
Grand Marais, Mich	Oct. 19–Nov. 5	Do.
Portage Entry, Mich	Oct. 17–Nov. 8	Do.
Huron Island, Mich	do	Do.
Portage Lake Canal, Mich	Oct. 17–Nov. 5	Do.
Keystone, Mich	Oct. 13–31	Do.
Agate Harbor, Mich	do	Do.
Copper Harbor, Mich	do	Do.
Manitou Island, Mich	Oct. 13–Nov. 4	Do.
Point Abbey, Mich	Oct. 17–Nov. 7	Do.
Isle Royale, Mich	Sept. 28–Nov. 15	Lake trout and whitefish.
Bemidji, Minn	Apr. 17–May 12	Pike perch.
Gloucester, Mass.:		
Plymouth, Mass	November–May	Cod and pollock.
Marblehead, Mass	February and March	Cod.
Ipswich Bay, Mass	November–May	Cod, haddock, and flounder.
Rockport, Mass	do	Cod, pollock, and haddock.
Leadville, Colo.:		
Englebrecht Lakes, Colo	Sept. 25–Nov. 23	Brook trout.
Turquoise Lake, Colo	Oct. 15–Dec. 2	Do.
Mount Massive Club Lakes, Colo	Oct. 17–Dec. 1	Do.
Carroll Lakes, Colo	Oct. 21–Nov. 22	Do.
Wurts Lake, Colo	Oct. 13–Nov. 22	Do.
Baker Lake, Colo	Apr. 24–May 18	Rainbow trout.
Northville, Mich.:		
St. James, Mich	Nov. 3–21	Lake trout and whitefish.
St. Ignace, Mich	Oct. 21–Nov. 28	Do.
Manistique, Mich	Nov. 8–15	Lake trout.
Fairport, Mich	Nov. 9–20	Do.
Northport, Mich	Nov. 8–27	Do.
Leland, Mich	Nov. 8–22	Do.
Naubinway, Mich	Nov. 5–24	Whitefish.
Scotts Point, Mich	Nov. 4–17	Do.

Egg-collecting stations—Continued

Station	Period of operation	Species handled
Put in Bay, Ohio:		
Port Clinton, Ohio	Nov. 13–Dec. 4	Whitefish.
Do	Apr. 6–May 4	Pike perch and yellow perch.
Do	June 2–25	Carp.
Catawba Island, Ohio	Nov. 13–Dec. 1	Do.
Middle Bass, Ohio	do	Do.
Do	Apr. 10–28	Pike perch.
North Bass, Ohio	Nov. 12–Dec. 1	Whitefish.
Do	Apr. 16–28	Pike perch.
Toledo, Ohio	Nov. 19–Dec. 3	Whitefish.
Do	Apr. 7–May 4	Pike perch.
St. Johnsbury, Vt.: Lake Dunmore, Vt.	Oct. 24–Nov. 9	Lake trout.
Saratoga, Wyo.:		
Big Creek Lakes, Wyo	October and November.	Brook trout.
Sage and Canon Creeks, Wyo	March, April, and May.	Rainbow trout.
Springville, Utah:		
Fish Lake, Utah	Nov. 6–Dec. 3	Brook trout.
Panguitch Lake, Utah	Apr. 19–May 26	Rainbow trout, black-spotted trout.
Strawberry Reservoir, Utah	May 29–June 13	Black-spotted trout.
Woods Hole, Mass.:		
Waquoit, Mass	Feb. 1–Apr. 13	Winter flounder.
Menemsha Bight, Mass	Feb. 13–Apr. 13	Do.
Newport, R. I	Mar. 20–Apr. 11	Do.

FISH FOOD USED AT HATCHERIES

The following table shows the amounts and kinds of food used at fish-cultural stations of the bureau during 1925, with the cost per pound of each.

Pounds and cost per pound of fish food used during the fiscal year 1925

PACIFIC SALMON STATIONS

Station	Salted salmon		Canned salmon		Salted salmon eggs		Beef liver	
	Pounds	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*
Baird and substations, Calif	7,000	$0.02					755	$0.10
Baker Lake and substations, Wash	1,100	.0236	6,649	$0.0016			2,308	.09
Clackamas and substations, Oreg	23,000	.01	26,650	.027	400	$0.005	1,469	.10
Quinault, Wash			3,900	.035			68	.06
Yes Bay, Alaska	1,400	.0164	100	.005			200	.11
Total	32,500		37,299		400		4,800	

Station	Beef spleen		Sheep liver		Hog liver		Lights	
	Pounds	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*
Baird and substations, Calif	1,123	$0.08						
Baker Lake and substations, Wash	2,050	.0576						
Clackamas and substations, Oreg	15,394	.0436			641	$0.085	756	$0.085
Quinault, Wash			1,390	$0.0615	50	.06		
Total	18,567		1,390		691		756	

ROCKY MOUNTAIN TROUT STATIONS

Station	Beef liver		Hog liver		Cereal		Beef hearts		Sheep liver	
	Pounds	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*
Bozeman, Mont	11,123	$0.0666	11,314	$0.0543						
Leadville, Colo							2,702	$0.0455		
Saratoga, Wyo	3,740	.065					2,566	.05		
Springville, Utah	11,529	.0454			10,500	$0.0283	13,364	.055		
Spearfish, S. Dak	26	.07					1,950	.0475	8,237	$0.0475
Total	26,418		11,314		10,500		20,582		8,237	

Pounds and cost per pound of fish food used during the fiscal year 1925—Con.

NEW ENGLAND TROUT AND SALMON STATIONS

Station	Beef liver		Beef spleen		Beef hearts	
	Pounds	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*
Berkshire trout hatchery, Mass	696	$0.1197	3,076	$0.0516		
Craig Brook, Me	619	.119			355¼	$0.066
Nashua, N. H	1,104	.0895				
St. Johnsbury, Vt	924	.05			19	.05
York Pond, N. H.[1]	1,637	.05			3,270	.0472
Total	4,980		3,076		3,644¼	

Station	Sheep liver		Hog liver		Fish meal	
	Pounds	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*
Craig Brook, Me	1,244	$0.0664	6,063	$0.054		
Nashua, N. H	7,721	.0462			100	$0.037
Total	8,965		6,063		100	

[1] The York Pond substation also consumed 505 pounds of horse meat at $0.013 per pound, 245 pounds of fish trimmings at $0.04, 100 pounds of beef and bob veal at $0.01, and 2 gallons of cod-liver oil at $3.40.

COMBINATION TROUT AND POND FISH-CULTURAL STATIONS

Station	Beef hearts		Sheep liver		Low-grade flour		Cereals	
	Pounds	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*
Erwin, Tenn	10,904	$0.055	8,856	$0.0525			3,900	$0.0265
Manchester, Iowa	7,783	.0455	9,894	.0426	410	$0.02	250	.02
Neosho, Mo., and substations	8,615	.035	5,897	.035	1,200	.0182		
White Sulphur Springs, W. Va	11,210	.056	15,786	.049				
Wytheville, Va	15,536	.0575			14,842	.005		
Total	54,048		40,433		16,452		4,150	

Station	Fish meal		Hog hearts		Clabbered milk		Beef liver	
	Pounds	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*
Erwin, Tenn	100	$0.037						
Manchester, Iowa	100	.037						
Neosho, Mo., and substations			6,155	$0.035	77	$0.10		
White Sulphur Springs, W. Va							510	$0.08
Wytheville, Va	50	.0238						
Total	250		6,155		77		510	

POND FISH-CULTURAL STATIONS

Station	Fish		Fish meal		Low-grade flour		Beef hearts		Beef liver	
	Pounds	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*	*Pounds*	*Cost*
Cold Springs, Ga	3,780	$0.10	313	$0.085	267	$0.03				
Edenton, N. C	24½	.13								
Louisville, Ky							634	$0.10	8½	$0.10
Mammoth Spring, Ark							1,471	.0678		
Orangeburg, S. C							2,177	.10		
Tupelo, Miss							2,557	.09		
Total	3,804½		313		267		6,839		8½	

HATCHERY FISH-CULTURAL NOTES

DECISION REGULATING FISHING IN THE QUINAULT RIVER

Under date of December 15, 1924, new regulations governing salmon fishing in the Quinault River were approved and promulgated by the Bureau of Indian Affairs. With the view of regulating fishing within the reservation the regulations contain a clause providing for the collection of a royalty from Indians catching more than a specified amount of fish. The enforcement of this provision created so much dissension among the Indians occupying the most advantageous fishing grounds that they requested an injunction restraining the department from enforcing the regulations.

The case was taken up in the Federal court at Tacoma, Wash., and a decision rendered late in April was to the effect that the Indians have the right to fish within the waters of the reservation at any point and at any time. It also decreed that the entire system of fishing locations is untenable, and that one Indian has as much right to a certain location as another. Another important feature of the decision is that the department is authorized to enforce only such regulations as the tribe may see fit to adopt.

According to this decision the Government has no jurisdiction over the fishing in the Quinault reservation, and apparently there is nothing to prevent the Indians from fishing even in Quinault Lake. This means the depletion of the sockeye salmon of the Quinault River, because the Indians are permitted to fish in its lower reaches as long as the salmon runs justify it, and then to follow the runs to Quinault Lake and there resume fishing on the spawning grounds.

FISH CONSERVATION IN WEST VIRGINIA

The fisheries authorities of the State of West Virginia are thoroughly alive to the importance of restocking the streams of the State with the more valuable species of fish, and have recently passed very effective protective laws. Many of the streams have been closed to fishing, and wardens have been employed to patrol them constantly.

An effort is being made to eliminate, or at least greatly reduce, the pollution of the waters of the State, and if the present plan can be carried out successfully West Virginia will rank among the foremost States in the matter of conservation.

EXPERIMENTAL FEEDING OF YOUNG TROUT

Early in the year the bureau conducted feeding experiments at several of its stations for the purpose of determining the value of fish meal as a food for trout.

On January 26 two lots of young trout, each containing 1,000 fish and weighing 10 ounces, which had previously been fed for 30 days on beef heart exclusively, were segregated at the Wytheville (Va.) station. One lot was fed on a mixture of beef heart and fish meal in equal proportions, while the other (the control lot) continued on a beef-heart diet. At the close of the test, on February 26, the control lot numbered 869 and weighed 17.5 ounces, while the other lot had been reduced to 827 fish with a total weight of 15.25 ounces. This was typical of the results achieved at other stations, and appears to indicate the superiority of an all beef-heart food.

SUCCESSFUL STOCKING OF MONTANA'S LARGEST LAKE WITH GREAT LAKES WHITEFISH

About four years ago the Montana fish and game authorities obtained from one of the bureau's Great Lakes stations a consignment of eyed whitefish eggs with the view of determining the possibility of developing a commercial fishery in Flathead Lake. The attempt to commercialize this lake aroused so much adverse criticism and antagonism on the part of the fishermen of the State that after making one plant of fish the work was abandoned. While the State fish and game commission was engaged in net fishing in the lake in June, 1925, it was discovered that the initial plant of fry had borne results, practically every seine haul containing fine examples of whitefish (*Coregonus clupeiformis*). This demonstrated success of a single plant of the species has renewed interest in the project, and many of the sportsmen who formerly opposed it on the ground that it might prove detrimental to game fishing are now in favor of the scheme.

BROOD PIKE AT SWANTON, VT.

An interesting feature of the pike perch work at Swanton, Vt., was the unusually large number of brood fish taken in seines, 7,379 of such fish being secured, as compared with 4,319 in the preceding year. At one of the seining beaches over 1,000 large brood fish were taken in a single day.

RIPE HALIBUT EGGS

Ripe halibut eggs in large quantities were found in close proximity to the ice fields off Riggs Point, in the Strait of Belle Isle, on May 21, 1925. Captain Morrissey, of the schooner *Henry Ford*, stated that for the first time in his many years of experience in the halibut fisheries he saw large numbers of halibut with eggs running freely.

COMMERCIAL FISHERIES

The work at a majority of the bureau's stations and substations is devoted principally to the propagation or salvage of the more important commercial fishes. Some of the species referred to this classification are the salmons of the Pacific coast, the lake trout, whitefish, and cisco of the Great Lakes, the marine fishes of the Atlantic coast (including the cod, pollock, haddock, and flounder), such anadromous fishes as the shad, glut herring, and Atlantic salmon, the buffalo fishes of the Mississippi River region, and the carp. The work with the latter species is confined to certain sections of Lake Erie.

PACIFIC SALMONS

Fish-cultural operations dealing almost exclusively with the Pacific salmons are conducted at all of the bureau's stations and substations located on the Pacific coast. The results of the year's work in this region generally indicate a considerable decline in the distributions as compared with 1924, due principally to adverse climatic conditions prevailing in some sections during the spawning season.

Afognak (Alaska) Station

[Frank L. Snipes, Superintendent]

For the second successive season the number of sockeye salmon ascending to spawning grounds in the vicinity of the Afognak station was very small, in consequence of which it was deemed advisable to again defer propagation work and allow the few fish in evidence to deposit their spawn naturally. The annual run of this species into Letnik Lake lasted from May 30 to September 20, the total escapement for that period amounting to 10,317, but little in excess of last year's record.

In the fall of 1921 this station made a fair collection of sockeye-salmon eggs, but during the succeeding spring the fry were attacked by disease and suffered heavy mortality. Shortly after the surviving fish had been planted, the yearling salmon in the lake appeared to be affected by the same trouble, and they perished in large numbers. According to the 4-year cycle theory, therefore, a poor run of salmon may be expected in Letnik Lake during the 1926 season, which conditions at the close of the fiscal year 1925 would seem to confirm. Between July 31 and September 26, 1924, a large run of humpback salmon entered Letnik Lake, the count registering nearly 16,000. It is very unusual for humpback salmon to ascend this lake to any extent.

The annual ascent of large numbers of Dolly Varden trout into the lake is considered a serious obstacle to the success of salmon propagation at the Afognak station. These fish commence devouring the eggs as soon as they are deposited, and continue to prey upon the young salmon as long as there are any in the lake. The destruction of thousands of the trout every year has not seemed to make much impression upon their numbers. Quite recently a trap was installed for the purpose of intercepting the fish at the counting weir, but this device is still in the experimental stage. As an illustration of the destructiveness of Dolly Varden trout, an examination of the stomachs of large numbers of them revealed from 300 to 400 undigested salmon eggs and fry. It is not unusual to find from 100 to 200 salmon eggs and fry in the stomach of a trout 8 to 10 inches long.

Among the more important items of repair work accomplished during the year may be mentioned the completion of the wagon road leading from the station grounds to tidewater on Letnik Bay and the construction of a new bulkhead to protect the station grounds fronting on the lake.

Yes Bay (Alaska) Station

[J. L. Gardner, Superintendent]

The year's work at this station was confined to the propagation of the sockeye salmon. Shortly after completing the installation of the racks, on July 22, a few sockeye and humpback salmon appeared in the river below, but no eggs were taken until September 8. During the intervening period the seining grounds were improved by the removal of all débris between the rack and the lake, and two of the seining beaches were extended (one 20 feet and the other 40 feet) by grading the river banks and covering them with gravel. Heavy rains late in August raised the river level to a point within 2 inches of the top of the rack, and on September 3 and 4 the entire station force was constantly employed in keeping it cleared of leaves and débris. During this time water was flowing around both ends of the rack on the shores, permitting the passage of fish in small numbers. The flood began to subside on the 5th, and three days later fishing was taken up and continued to be prosecuted up to the 25th of the month, during which time 30,080,000 eggs were secured. This figure does not represent all that could be obtained, as collections were suspended as soon as a sufficient number were on hand to fill the hatchery to capacity with fry, and fish enough to yield from 15,000,000 to 20,000,000 additional eggs were released to spawn under natural conditions.

When taken, the eggs appeared to be of extra fine quality, but by the time the eye spots had developed it was apparent that a considerable number were unfertilized, undoubtedly because the eggs were taken from fish not fully matured.

The results of incubation were very good, however, the losses amounting to only about 8¼ per cent.

Early in the winter the entire water-supply pipe line froze during a protracted cold spell, and as very little water was available in the hatchery the 6,300,000 fry on hand had to be liberated and the eggs crowded into a comparatively small space. In this way they were safely carried through the succeeding 15 days, at the expiration of which time water conditions were again normal. All fry hatched from these eggs were reserved for rearing to the fingerling stage, and most of them were still on hand at the close of the fiscal year. Due probably to the occurrence of heavy rains and ususually cold water during the incubation period, there was no evidence during the season of the trouble which has occasionally been experienced in recent years from the accumulation of gas in the hatchery water supply.

During the year 3,219 predatory fish were taken in gill nets and destroyed. Very few Dolly Varden trout were seen on the spawning grounds, probably because they were intensively fished for earlier in the season.

Baker Lake (Wash.) Station and Substations

[Joseph Kemmerich, Superintendent]

Fish-cultural work in this field was conducted at only five points, the Brinnon eying plant, formerly operated, having been abandoned as a result of experiments made during the previous year which demonstrated that eggs collected in that region could be successfully transported in the green state to the Duckabush and Quilcene hatcheries. From the several species of salmon handled at this group of stations, 48,578,000 eggs were obtained; this being a reduction of approximately 2,000,000, compared with the total of the previous year. The decrease is attributed to the unfavorable weather encountered in some fields while certain species were spawning, and to the fact that it was an off year for the run of humpback salmon in Puget Sound waters. The collections were augmented by the receipt, from outside sources, of more than 16,000,000 eyed eggs of the chinook, silver, and humpback salmons. Such transfers were handled at the Birdsview, Duckabush, and Quilcene substations.

Baker Lake (*Wash.*) *station.*—Fish-cultured operations, addressed to the sockeye and silver salmons, were in progress practically throughout the year. Very gratifying work was accomplished with the sockeye salmon, the egg collections being the largest in the history of the station. Beginning July 1, the trap previously installed in Baker River was fished almost daily until the end of the run on August 21, and 14,558 captured salmon were removed therefrom to the station inclosure. All of the 22,000,000 eggs secured from these fish were of uniformly good quality, and the losses, both in the incubation and fry stages, were merely nominal.

The run of silver salmon in Baker River was the smallest in some years. This, no doubt, was occasioned in part by unsatisfatory water conditions, but the power dam in course of construction at Concrete, Wash., was a contributing factor, as it was apparent that the fish were unable to pass through the diversion tunnel. Of the brood salmon captured late in October and held for ripening, the 404 females available at spawning time yielded 1,380,000 eggs of good quality. Following the practice of recent years, the eggs were eyed at the station and then transferred to the Birdsview substation, the mode of conveyance being by pack horse as far as Concrete and by autotruck the remainder of the distance.

Birdsview (*Wash.*) *substation.*—As in recent years, salmon propagation at this point was seriously hampered by turbid water in Grandy Creek, the result of the tearing up of the banks and bed of the stream by the extensive logging operations going on near its headwaters. The water entering the hatchery was so muddy that the eggs and fry in the troughs could not be seen, and it was almost constantly necessary to remove the accumulation of sediment in the trays. During September and early October, ordinarily the spawning season for chinook salmon in this creek, the water level was so low that fish could not enter. Following several light rains later in October a few chinooks were taken in the trap and 180,000 eggs secured. At the close of the fiscal year the fingerlings resulting from these eggs were being held in ponds and fed, at which time they were 2½ inches long.

The few fingerling silver salmon carried over from the previous fiscal year were liberated early in August in the Skagit River. Eggs of this species to the number of 3,163,000 were secured between October 18 and January 24, a great many of the earlier ones being taken from fish that had been held in pens for some time to ripen. These, with the addition of the eggs furnished from the

Baker Lake station early in March, produced 4,113,000 fry and one consignmen of 100,000 eyed eggs, the latter being shipped to the Lincoln Park Aquarium Chicago, Ill. The fry were carried on trays until the yolk sac was absorbed when most of them were planted. A few were held to be reared to the fingerlin stage.

Following a slight rise in water level, a few male and female sockeye salmo entered the creek, and 35,000 eggs taken from them were hatched. The resultin fish, in the No. 1½ stage, were on hand at the end of June. One hundred an fifty thousand sockeye eggs, transferred to this point from Baker Lake station were transported by means of truck and pack team to Illabot Creek, 11 mile distant from Birdsview, and seeded in the gravel along the shores of the lake This is a cold, glacial body of water, and as there is a good volume of water in it tributary creek during the summer and fall months, it is believed it may b possible to establish a run of salmon in the lake. With this object in view plants of eggs will be made here every spring until a sufficient length of time ha elapsed to determine what the results will be.

The fry and fingerling steelhead salmon on hand at the opening of the yea were distributed during August, various applicants being supplied, and th remainder was planted in tributaries of the Skagit River. Steelhead eggs to total of 584,000 were taken between March 7 and May 21, this being a fai average compared with the work of recent years. However, owing to the neces sity of holding the brood fish in pens for a considerable period to ripen, a larg percentage of them proved infertile.

Duckabush (*Wash.*) *substation.*—The new trap site used for the first time las season having been destroyed by flood waters during the succeeding winte permission was obtained to install a temporary trap under the State Olympi highway bridge. The first chum salmon of the season appeared here late i August, and beginning September 1 seining operations were conducted almos daily up to September 20, when a 20-foot section of the rack was carried awa when a rise of several feet in the water level occurred. The fish held belo were thus able to escape upstream, and during the week intervening before th river was again at its normal height the remainder of the run passed up, puttin an end to the season's work. The egg collections amounted to 3,340,000.

The trap in Walcotts Slough, near the former eying station at Brinnon, Wash was placed in condition for work late in November with the view of collectin eggs from the late run of chum salmon in that field. Brood females to th number of 3,508 were taken between December 1 and January 3, and from the 9,760,000 eggs were secured for transfer to the Duckabush hatchery. Thoug transported a considerable distance in the green stage, the losses on these egg during incubation were no greater than on the local collections. On a numbe of occasions men were detailed from the Quilcene substation to assist in th work at Wolcotts Slough and took back with them such surplus eggs as coul not be handled in the Duckabush hatchery. Operating in this manner, it i estimated that a saving of at least $1,000 was effected over the old system c eying the eggs at Brinnon. The product of the eggs was conveyed back to th slough and liberated in native waters.

A large run of silver salmon appeared in the Duckabush River in Decembe and January, but the water level at that time was so high that practically all c the fish surmounted the rack and spawned upstream. Early in February th station received 2,000,000 eyed silver-salmon eggs from the Gold Bar hatcher of the Washington Fish Commission. These were incubated with the loc collections and the fry were released in the sac-absorbed stage.

As 1924 was the alternate year for the run of humpback salmon into Puge Sound waters, no eggs of that species were available during the fall. Howeve the station received by transfer 4,500,000 of the humpback eggs taken in Alaska waters by the Washington fisheries authorities, and the product was placed i the station ponds in the advanced fry stage, the pond screens being remove so that they might pass at will into the Duckabush River. In an effort to esta lish a run of chinook salmon in the Duckabush River 500,000 eyed eggs of tha species were transferred to the station early in December from the Little Whit Salmon (Wash.) hatchery. When ready to take food, the fry resulting fro this consignment were transferred from trays to the ponds and fed three time daily until May 28, when they were liberated. On account of the prevailin high water during the spring, most of the run of steelhead salmon was able t surmount the permanent rack and pass up the river, and only 35,000 eggs we secured. At the close of the year the fry incubated from these eggs were bein cared for in troughs in the hatchery.

Quilcene (Wash.) substation.—Fish-cultural operations in this field were in progress practically throughout the year. Collections of chum, silver, and steelhead-salmon eggs were made, while eyed eggs of the humpback, chinook, and silver salmons received from other hatcheries were handled. The efforts put forth to collect eggs from the early run of chum salmon met with slight success. Owing to the prevailing low water in both the Big and Little Quilcene Rivers very few fish entered these streams, and the total number of eggs collected was only 585,000, notwithstanding the fact that both traps were fished at frequent intervals and both rivers were seined daily below the racks as long as there was any hope of securing returns. During the late run of this species, beginning about November 15, water conditions were so much improved that nearly 3,000,000 eggs were obtained. At this time some of the station employees were making frequent trips to Walcotts Slough to assist in the work there and to transfer to the home station such eggs as could not be cared for at Duckabush. As a consequence of the operations at all points and during both runs of salmon 4,010,000 eggs were secured, from which 3,741,150 fry in the advanced stage were developed and released in local tributaries of Puget Sound.

From a shipment of 5,500,000 eyed humpback-salmon eggs taken in Alaska waters by the State of Washington and turned over to this station for incubation, 5,368,500 fry were produced. Of these, 2,968,000 were released in the advanced stage in the Big Quilcene River; the remainder were returned to the State to be used in connection with a feeding experiment to be conducted in a pond located in a salt-water lagoon not far from the Quilcene hatchery.

Between October 27 and February 6 the station collected 2,120,000 silver-salmon eggs. These were incubated with 2,000,000 eyed eggs of that species furnished from the Gold Bar hatchery of the Washington fisheries department, and the resulting fry, in the sac-absorbed stage, were liberated locally. Transfers of eggs from other fields included one shipment of 500,000 of the chinook salmon furnished by the Little White Salmon hatchery with the view of attempting to establish a run of that species in Quilcene waters. During the steelhead spawning season (extending from March 17 to May 11) 375,000 eggs were collected, some being taken from brood fish held for a time in the station ponds to ripen. The resulting fry were on hand at the close of the fiscal year.

Sultan (Wash.) substation.—Elwell Creek, upon which this substation depends for its egg collections, was visited during the fall by a large run of chinook and silver salmon, enough fish of each species to yield several million eggs being in evidence. Unfortunately the station was poorly equipped to take advantage of the opportunity. The trap in use was old and partly ineffective, and dependence had to be placed on hooking and dip nets for the capture of the fish. Working under such conditions, 806,000 chinook-salmon eggs were taken; but in October, shortly after the run of silver salmon began, the trap was entirely demolished as a result of a considerable rise in the water level of the creek, putting an end to the work. The collection of silver-salmon eggs amounted to 690,000. Approximately 85,000 fry and fingerling steelhead salmon, the product of the previous fiscal year, were liberated in local waters during July. Owing to inability to conduct fishing operations, no eggs of that species were collected during the spring of 1925.

QUINAULT (WASH.) STATION

[PHILO B. HAWLEY, Superintendent]

The construction of a rearing-pond system at this station, undertaken during the previous fiscal year, was completed in May, 1925. The series comprises six concrete ponds of the long, narrow type, with sloping sides, each inclosure being 75 feet long and 6 feet wide and with an average depth of 30 inches. The addition of this system provides the station with a capacity for rearing 300,000 sockeye-salmon fingerlings.

As has been explained previously, the sockeye-salmon run into the lower Quinault River extends from about April 1 to the end of August, making it impossible to include in a single annual report a complete census covering an an entire season's run. The daily count maintained during the spring and summer of 1924 indicated the passage of 136,774 salmon, this number being approximately 27,000 less than the count of the previous year and about 100,000 less than that in 1922. In the spring of 1925 counting was begun on March 19, and by the end of the fiscal year the record indicated that the number of salmon passing was materially smaller than in any corresponding period since the weir was established.

The reports received from the superintendent of the Quinault Indian Reservation show that during the commercial fishing season of 1925, extending from April 1 to July 1, 54,000 salmon, in round numbers, were captured by the Indians, who received for their catch 75 cents per fish. This is the highest price ever paid for sockeye salmon in the Quinault region.

During the spring of 1925 the station's counting operations occasioned considerable ill feeling on the part of the local Indians, who charged that the weir was detrimental to a large salmon run in that many of the fish were killed by jumping against the webbing of the leads and traps. In order to gain first-hand information in the matter two trips were made to a point several miles below the weir, the first on June 30, when 30 dead fish were discovered, and the second on July 17. The latter trip was occasioned by the receipt of advice from the superintendent of the reservation that hundreds of dead salmon were to be seen along the river as a result of injuries received at the weir, but only 20 were discovered. From the investigations made it was clear that the reports spread by the Indians were greatly exaggerated and were circulated because of their antagonistic attitude toward the bureau's work.

Fish-cultural operations at this station are concerned principally with the sockeye salmon. Racks and traps were installed in Big and Merryman creeks 10 days prior to the opening of the spawning season for the purpose of collecting eggs, and the first were secured on November 1, a time extremely unfavorable for the work because of heavy freshets. Late in October and early in November the racks in both creeks were under water for the greater portions of the time, and it was impossible to operate a seine to advantage before November 10. From that time on conditions were more favorable, and collections were made daily up to the close of the season on December 12. A total of 12,350,000 eggs of fine quality was secured, of which 3,000,000 in the eyed stage were sent to the Oregon Fish Commission. The remaining eggs were hatched, and the output of fry liberated on the local spawning grounds, most of them in the fingerling stage.

Although no special effort had been made to secure them, a considerable number of silver-salmon eggs and a few chinook eggs were taken incidentally with the sockeye eggs. More than 100,000 steelhead-salmon eggs were collected in May from fish taken in the counting weir. The resulting fry were on hand at the close of the year, it being the intention to rear them to fingerling size and then plant them in Quinault Lake or its tributaries. A consignment of 25,000 eyed brook-trout eggs received from the Washington State Fish Commission was incubated practically without loss, and the resulting fry were used to stock virgin lakes in the upper Olympic Mountains.

Late in January 260,000 silver trout eggs were received from the Lake Whatcom hatchery of the Washington Fish Commission. After being reared to suitable size, the fry from these eggs will be marked and then liberated in the lower Quinault River, well on their way to the ocean, the object being to determine whether they will eventually return as fish of larger size than the ordinary silver trout which remain constantly in fresh water.

CLACKAMAS (OREG.) STATION AND SUBSTATIONS

Clackamas (Oreg.) station.—The installation of racks and other necessary equipment having been completed previously, the capture of adult chinook salmon was undertaken on the 1st of October and prosecuted continuously for a month, at the expiration of which time the prevailing heavy rains had brought the Clackamas River to such a high level that the racks were swept away. The brood fish secured yielded 2,223,000 eggs, which, with eggs transferred from other fields in the State, gave the hatchery a total of 8,497,600. These were incubated with a loss of only 2 per cent, and the product was liberated on suitable spawning grounds as Nos. 2, 2½, and 3 fingerlings. In the course of the year the station received small numbers of silver salmon, steelhead salmon, and brook trout eggs from various auxiliaries, which were successfully incubated. It also received 200,000 eggs of the so-called "silver trout," which were furnished by one of the Washington State hatcheries.

With the view of attempting the establishment of a run of smelt in the Clackamas River, the station force and the Oregon fish and game authorities, working in cooperation, captured approximately 13,000 live smelt during the spring run in Sandy River and transplanted them in the Clackamas River.

Upper Clackamas (Oreg.) substation.—Collections of chinook-salmon eggs in this field were conducted from August 26 to September 19, 2,291,600 being obtained, which exceeds last year's collections by approximately 400,000 eggs.

After being developed to the eyed stage, the entire lot was transferred to the Clackamas station, and the substation was closed for the season.

Little White Salmon (Wash.) substation.—Fishing for brood chinook salmon began on September 17, and by October 10 a number sufficient to meet all requirements had been secured. The racks were therefore removed and the remaining fish allowed to ascend the river to the spawning grounds. Due to the continued low stage of the stream much difficulty was experienced in maintaining a depth of water necessary for the maintenance of the fish in the live pens, and it finally became necessary to excavate a location for the pens in the bed of the river. Eggs to the number of 22,640,000 were taken, of which approximately 6,562,000 were shipped in the eyed stage to other points. The remaining eggs were incubated and the product reared to the No. 2½ fingerling stage, when they were liberated in the Little White Salmon River.

A consignment of 200,000 brook-trout eggs, received from one of the Washinton State hatcheries, was successfully incubated, and part of the resulting fry were distributed to applicants. The product of 95,000 steelhead salmon eggs, transferred from the Applegate Creek auxiliary, was still on hand at the close of June.

Big White Salmon (Wash.) substation.—There was an unusually good run of chinook salmon in the Big White Salmon River and also in Spring Creek, the latter yielding about half the season's take of eggs. An advantage in work on this creek is the entire lack of high-water stages and the fact that no expensive racks need be constructed and maintained. As they ascend the mouth of the creek, the salmon pass through a fish ladder into a pool, where they are readily accessible. They are simply dipped out, assorted, and the males and females segregated in separate inclosures prepared for them in the creek. During the period from September 20 to October 7, a total of 14,420,000 eggs was taken in both streams. On reaching the eyed stage, approximately 5,000,000 were shipped to the Oregon Fish Commission. The young fish hatched from the remaining eggs were reared to the No. 2½ fingerling stage and then released on the native spawning grounds. The food used in the rearing operations consisted of salted salmon, canned salmon, and cattle spleen.

Rogue River (Oreg.) substation.—Despite the handicap of a very low water level in the Rogue River during the summer, which necessitated the building of wing dams at each water wheel to insure its efficient operation, the yield of chinook salmon eggs at this point was about on a par with results in recent years. Immediately after the completion of the chinook-salmon run, racks were installed in Big Butte and Elk Creeks for the interception of silver and steelhead salmon, though the equipment in the former was washed out during a later period of high water, allowing most of the silver salmon held below to escape. The egg collections of this species, amounting to 1,336,000, were made between October 30 and December 11. The spring collection of steelhead eggs was somewhat above the average, the total amounting to 868,000, as compared with 506,000 in the preceding year. Small numbers of eggs of the sockeye salmon and silver trout, received by transfer from other stations, were successfully incubated, as was also a consignment of brook trout eggs donated by the State of Washington. Some of the product of this stock was still on hand when the fiscal year closed.

Applegate Creek (Oreg.) substation.—Active fish-cultural operations for the season began at this point on November 18 with the collection of the first lot of silver salmon eggs. As the best part of the run of this species occurred during high-water stages, and a majority of the fish were able to ascend to spawning grounds above the dam, the yield of eggs for propagation purposes was small, amounting to only 1,749,000. During the very favorable natural conditions existing in the early spring, a sufficient number of steelhead salmon were captured to yield at least 3,000,000 eggs, but many of the penned fish died later and only 1,771,000 eggs were obtained. On reaching the eyed stage, 500,000 of these were shipped on assignment; the fry hatched from the remainder were in process of rearing when the fiscal year closed.

Salmon (Idaho) substation.—At the opening of the fiscal year 100,000 young chinook salmon, the product of eggs shipped from the Little White Salmon substation, were on hand. On reaching the No. 3 fingerling stage they were tagged and released in local streams to determine whether it would be possible to establish an earlier run of fall-spawning salmon in the Columbia River.

In the Lemhi River field egg collections were made from the middle of August into early September, 3,658,000 eggs being taken. The racks in the Pahsimeroi River were installed about 10 miles below the site of last year's operations and eggs were taken throughout the last half of September. Owing to the very low water level in this stream, however, most of the run of fish spawned in the Snake River channel and less than 500,000 eggs were secured.

Two consignments of rainbow-trout eggs—one of 105,000 shipped by the Idaho State Fish Commission, and one of 25,000 transferred from the Meadow Creek (Mont.) field—were hatched during the season and the product liberated as fingerling fish in various waters of the region.

Sandy River (*Oreg.*) *substation.*—The principal fish-cultural work at this point consisted in the incubation of 1,000,000 chinook salmon eggs transferred from one of the Oregon State hatcheries and the rearing of the product. The young fish were released in the Sandy River in the Nos. 2 and 2½ fingerling stages. A fair run of chinook salmon made its appearance below the dam in this river, but as has occurred in previous seasons, the entire flow of water in the river channel was diverted by the Portland Electric Co. for industrial use, and all of the fish perished. During the spring traps were built in the fish ladder to intercept the run of steelheads. The take of eggs of this species was small and of inferior quality, and on the first of June it was decided to close the station for an indefinite period.

Baird (Calif.) Station and Substations

The outcome of fish-cultural operations in the California field was very discouraging, the egg collections as a whole being much smaller than in 1924 and the output of young fish correspondingly smaller. The poor results are attributed to abnormally low water stages in the streams at spawning time and unusually muddy water, the latter condition being brought about by the deposit of volcanic ash from Mount Shasta.

Baird (*Calif.*) *station.*—At this station traps for intercepting the run of chinook salmon in the McCloud River were installed early in August, 1924. Owing to the low stage of the stream this was easy of accomplishment, but as the water remained low throughout the spawning period only comparatively few salmon were secured. The work of capturing adult fish was conducted from August 28 to October 16, though the bulk of the fish was obtained in late September. Late afternoon was chosen as the time for spawning operations, experience having demonstrated that better results are obtainable then. The collections, totaling 1,200,000 eggs, produced 200,000 eggs in excess of the take of the previous year. On account of the prevailing drouth it was impossible to obtain water from the usual source of supply for incubating the eggs, and they were held in temporary troughs connected with a supply taken from a small creek until they were nearly ready to hatch, when they were transferred to the hatchery and a water supply secured by pumping.

Because of heavy rains much difficulty was experienced in the work of placing the rack for the spring run of salmon in 1925, and it was accomplished only through strenuous effort. Shortly after its completion, a 75-foot section of the structure was carried away by a heavy rainstorm, which continued unabated for 60 hours. The break was repaired as soon as possible, though it could not be made absolutely secure on account of the continued high water.

Battle Creek (*Calif.*) *substation.*—Arrangements were made early in the year for the collection of chinook-salmon eggs in the Battle Creek tributary of the Sacramento River. The work of seining the creek for adult fish was taken up on October 21 and continued until the run was over on December 1, when operations were transferred to the main river, but as no material results were obtained there the work was discontinued within a few days. As a result of the operations in the creek and river 887,500 eggs were secured. In order to supplement the stock in the hatchery, 500,000 eggs were transferred from the Mill Creek field and from the aggregate lot 1,330,000 healthy fry were incubated.

Mill Creek (*Calif.*) *substation.*—The drouth which prevailed in other parts of the California field also interfered with the work at the Mill Creek substation to the extent that the results attained were the most unsatisfactory in several years. Fish-cultural operations were undertaken as usual in late October, seining being conducted practically every day up to and including December 29. The eggs collected during the season amounted to 2,300,000, as compared with approximately 3,000,000 in 1924.

FISHES OF THE GREAT LAKES

The success of the bureau's fish-cultural operations in the Great Lakes region is dependent mainly upon the weather prevailing during the spawning season of the species handled. The range of operations extends from Rainy Lake, Minn., eastward to Lake Champlain, and the commercially valuable fishes to which particular attention is directed are the lake trout, whitefish, cisco, pike perch, and carp. Owing to unfavorable weather in practically all fields during the egg-collecting season, the output of these stations was considerably smaller than in the preceding year, the largest decline being in the case of the whitefish.

DULUTH (MINN.) STATION

[S. P. WIRES, Superintendent]

During the early fall arrangements were made for the collection of lake-trout eggs in Lakes Superior and Michigan. Small numbers were obtained daily at Washington Harbor and at other points near Isle Royale, Mich., between September 28 and October 9, when the beginning of the closed season necessitated discontinuing the work. It was resumed on October 15 and prosecuted to the middle of November, but the results were small owing to bad weather and the light run of fish in this region. Along the south shore of Lake Superior, where spawning was most active from October 13 to the close of that month, there was a good run of fish, and egg collections were correspondingly large. The eggs secured from the 15 fields occupied aggregated 21,535,000. On reaching the eyed stage 1,550,000 were shipped to applicants; fry and fingerling fish to the number of 12,752,500 were produced from the remaining stock and distributed, a large proportion being returned to the native spawning grounds.

On account of almost constant stormy weather no nets were set for the capture of whitefish on the natural spawning grounds at Munising, Mich., hence the station's collections of eggs of that species were limited to the Isle Royale field, where 1,560,000 were secured. As a result of operations in the vicinity of the Bemidji State hatchery, conducted in conjunction with the Minnesota Game and Fish Department, the station secured approximately 27,500,000 pike perch eggs between April 17 and May 3. To avoid the heavy losses incident to handling in the green state, the eggs were eyed at the point of collection and then transferred to Duluth. Managed in this way, the losses were kept at a minimum. The resulting fry, amounting to 13,000,000, were delivered to applicants in Minnesota, Michigan, and Wisconsin. The year's work also included the incubation of 360,000 eyed brook-trout eggs received during the early winter from commercial hatcheries in Massachusetts, Rhose Island, and Wisconsin, and 45,000 steelhead eggs transferred during the early part of May from the Clackamas (Oreg.) station.

NORTHVILLE (MICH.) STATION AND SUBSTATIONS

[W. W. THAYER, Superintendent]

The year's work at the Northville station consisted in the propagation of smallmouth black bass, bluegill bream, brook trout, and rainbow trout, the eggs of the two latter species being derived from outside sources. The smallmouth bass fry on hand at the beginning of the year were reared and distributed as fingerlings Nos. 2 and 3. On the last day of the following April, when the work of apportioning adult bass in the station breeding ponds was undertaken, it was discovered that some of the fish had spawned in their winter quarters, this fact being disclosed by the presence of several nests containing dead eggs. It is believed that this unusually early spawning was occasioned by the spell of unduly warm weather which prevailed in the latter part of April, and that the eggs were killed by a sudden lowering of the temperature which occurred shortly before the ponds were drawn.

In addition to the bass carried through the winter at the station, 196 adults were furnished from the Put in Bay (Ohio) station about the middle of May, this acquisition bringing the total to 325 brood fish. Spawning began in the breeding ponds on May 10 in water of 58°. After rising to 60° on the 17th, the temperature suddenly dropped to 52° on the 18th, but to all appearances the fry were unharmed. Approximately 200,000 fry of this species were hatched, of which 94,000, in the fry and fingerling stages, were distributed before the close of the year.

During the early part of the winter of 1924–25 the station received 1,100,000 eyed brook-trout eggs, 500,000 of which were transferred from the Pleasant Mount hatchery of the Pennsylvania Fish Commission. The balance consisted of commercial eggs purchased from dealers in Rhode Island and Massachusetts. All of this stock was of fine quality and from it a large percentage of healthy vigorous fry was produced. From a consignment of 129,000 rainbow-trout eggs received in May from the Paris (Mich.) State hatchery, 117,800 fry were hatched and distributed.

Alpena (*Mich.*) *substation.*—Negotiations in progress at the beginning of the fiscal year between the bureau and the city of Alpena led to the bureau's obtaining a 50-year lease on 1 acre of city land containing a 2-story brick building and a 1-story frame cottage, said property being used during the World War by the Navy Department in the operation of a radio plant. As soon as the transaction could be completed the hatchery was removed from its old location to the new site, and installed on a brick foundation in the rear of the brick building, which was fitted up as an office and an aquarial exhibit for the display of fishes common to the region.

From October 23 to December 4, 10,560,000 lake-trout eggs and 34,640,000 whitefish eggs were obtained over a territory extending from Black River to Cheboygan. Most of these were of good quality, though some of the eggs from around Cheboygan were poor. The partial failure in that field may probably be accounted for by the faulty method employed by the fishermen in taking and caring for the eggs prior to their delivery at the hatchery. In an effort to correct this condition an experienced spawn taker will be assigned to oversee the work near Cheboygan throughout the next collecting season.

The delay occasioned by the removal of the hatchery building and the installation of new piping for a water supply necessitated the retention of the eggs for a considerable time in egg cases and floating boxes. The percentage of hatch from those in the cases was very good, as they could be given daily attention, but the eggs in the boxes, held in the slip in the rear of the hatchery, were nearly a total loss. In the distribution of the fry, which work extended from March 27 to May 25, all plants intended for waters within a comparatively short distance of the hatchery were made by the local fishermen without expense to the bureau, thus materially reducing the cost of the work.

Charlevoix (*Mich.*) *substation.*—The high winds prevailing throughout the spawning season in the fields covered by the Charlevoix substation tended to reduce somewhat the collections of lake-trout eggs, though the loss was compensated for in large measure by the substitution of improved methods in the hatchery, so that the output of fry was nearly equal to the average of former years. Eggs of this species were received at the hatchery from November 3 to November 28, the season's take from the seven fields covered amounting to 34,361,000. In the course of the whitefish spawning period—from November 1 to November 30—22,960,000 eggs were taken in fields near Scotts Point, Naubinway, and St. Ignace. All of these were of good quality.

In addition to its work with the commercial species, the station received and hatched 11,000 landlocked-salmon eggs transferred from the Craig Brook (Me.) station, and 40,000 steelhead eggs shipped from the Grants Pass (Oreg.) substation. The resulting fry were delivered to applicants at Frankfort, Menominee, and Charlevoix, Mich. A filter for the improvement of the water supply was under construction during the early part of the fiscal year, and while not fully completed it was used to good advantage during the hatching season, removing practically all slime and other impurities from the water.

Put in Bay (Ohio) Station

[David Davies, Superintendent]

Shortly after November 1 the usual arrangements for obtaining whitefish eggs were effected with the commercial fishermen operating in various parts of Lake Erie, and on November 12 and 13 the field foremen visited the various fields for the purpose of distributing the necessary spawn-taking outfits. The season as a whole proved disappointing. Only a comparatively small catch of whitefish was made by the fishermen collecting eggs for the station, and in its efforts to obtain eggs in other parts of the lake the same conditions were encountered by the State. Up to the end of November it was generally believed by the fishermen that a larger run of whitefish would occur, but at about that time the weather suddenly turned cold, ice formed on the lake, and the fishermen were unable to reach their nets, many of which were frozen in the ice. Eggs were received at the station between November 18 and December 7, the total for the season amounting to 138,280,000. Of these, the Port Clinton field furnished 57,340,000, while the remaining eggs were derived from fisheries in the vicinity of Put in Bay, Toledo, Catawba, Middle Bass, and North Bass Islands. In view of the small collections, no shipments of either green or eyed eggs were made to other points, and all fry hatched were distributed on the natural spawning grounds within a radius of 10 miles from the station.

As compared with the results of former years the outcome of the pike-perch season's egg collections was fairly satisfactory, 218,200,000 eggs being secured. Of these, 177,775,000 were obtained in the Toledo field. Heretofore there has nearly always been a scarcity of large female fish, but last season such fish were captured in considerable numbers. The majority of the large fish were unripe, however, and many millions of eggs were lost because they were not in condition for propagation.

The collection of yellow-perch eggs was much larger than usual, exceeding last year's by more than 22,000,000. They were of good quality and produced a high percentage of strong, vigorous fry. One consignment of 6,000,000 green eggs was shipped by messenger to the Mammoth Spring (Ark.) station, and from the remainder 19,968,000 fry were hatched and liberated in Lake Erie.

Owing to unusually low water in the lake during June, the carp-propagation work was somewhat disappointing. Between June 2 and June 25 44,875,000 eggs were taken and from them 31,500,000 fry were hatched and distributed. All plants were made in the Portage River several miles above Port Clinton, Ohio.

CAPE VINCENT (N. Y.) STATION AND SUBSTATIONS

[J. P. SNYDER, Superintendent]

Active fish-cultural operations began at this station on October 18, when the work of collecting lake-trout eggs at Stony Island, N. Y., was undertaken. Heretofore practically all eggs of this species collected for the station have been obtained in the Province of Ontario in the vicinity of Pigeon and Simcoe Islands. Early in the fall preparations were made for the resumption of collecting operations in those fields, but a few days before the opening of the spawning season the islands were visited by a representative of the Ontario government, who notified the local fishermen that all eggs secured by them in those fields were to be turned over to the provincial hatcheries. The closing of the fields to the bureau left only two possible sources of supply for lake-trout eggs—Stony Island and Charity Shoals—which yielded a total of 114,000. The station also received 200,000 eyed eggs from the Charlevoix (Mich.) station. The fry resulting from both lots were delivered to applicants and planted in New York State waters.

The collection of whitefish eggs was again seriously curtailed by the refusal of the provincial authorities to permit the bureau's men to enter some of the more important fields on the northern side of the lake. The station was allowed to collect any available eggs in the vicinity of Brighton, Cobourg, and Port Hope, Ontario, but the results of the work at all these points were disappointing, due to unfavorable weather. Storm after storm occurred in rapid succession, destroying the nets and discouraging the fishermen. Only 8,100,000 eggs were secured at the three points.

On the New York side of the lake eggs were collected in the open waters near Cape Vincent as well as in Chaumont Bay, where there was a fairly good run of large whitefish. One of the peculiarities of the run in this section was that only a comparatively few small fish were in evidence. The run along the open shore of the lake was the largest that has occurred in many years, but weather conditions were extremely unfavorable. During a period of nearly two weeks at the height of the spawning season there was only one day when the nets could be lifted. On that occasion approximately 17,000,000 eggs were secured. In the somewhat better protected waters of Chaumont Bay the nets were lifted oftener and a fairly good collection of eggs resulted. Of the total number secured—55,485,000—420,000 were shipped in the eyed stage to applicants. The remainder were hatched, producing 36,500,000 fry, all of which were planted in Chaumont Bay and on other spawning grounds of the species.

Operations for the collection of cisco eggs were conducted in Chaumont, Fairhaven, and Sodus Bays on the American side of the lake and in Wellers Bay on the opposite side, permission to enter this field having been obtained from the Canadian authorities. In these four fields approximately 188,000,000 eggs were taken, the collection exceeding that in the fall of 1923, though the catch of fish was the smallest in some years. This falling off in the catch appeared to be general in all sections of Lake Ontario and can not be accounted for. The vegetable growth which formed on the whitefish and cisco eggs during the previous year gave no trouble last season.

In the latter part of December 586,000 eyed brook-trout eggs were received from commercial dealers in Rhode Island and Massachusetts and 483,600 were turned over to the station by the Pennsylvania Department of Fisheries; 136,920 rainbow trout eggs were received from a hatchery of the Michigan Conservation Department in return for cisco eggs previously furnished the State, and from the Swanton (Vt.) station 11,000,000 green pike-perch eggs and 4,000,000 eyed yellow-perch eggs were received. The fry from all of this stock was utilized in supplying applicants and in making public plants in suitable waters.

In response to a general demand for fingerling fish in preference to fry, 24 troughs and 12 large rearing tanks were constructed during the winter, and in cooperation with the Jefferson County Game and Fish Association these, with 24 additional troughs belonging to the association, were set up in a field near Watertown, N. Y., and used for the rearing of brook and rainbow trout to the large fingerling size before distributing them. The water supply for this rearing project was obtained from two spring-fed brooks.

SWANTON (VT.) SUBSTATION

[J. P. SNYDER, Superintendent]

During September, 1924, a considerable amount of repair and improvement work was accomplished at this substation. All pens for the holding of brood fish were enlarged and placed in good condition, power boats and skiffs were repaired and painted, a new live car for the transportation of brood pike perch from the fishing grounds to the hatchery was constructed, 200 additional jars were provided, and many minor repairs were made. Arrangements were completed early in March with the States of Pennsylvania and Vermont for the propagation of pike perch on a cooperative basis. Under the plan agreed upon the bureau furnished the services of two experienced fish-culturists, Pennsylvania supplied most of the requisite funds and the services of two men, receiving as its share of the returns 50 per cent of the eggs collected, while Vermont provided the services of one man and allowed the fishermen to sell all nongame fish taken in the nets to compensate them for the delivery of their brood pike perch for the hatchery work.

By March 23 the hatchery and its equipment were ready for active operations. Seining was undertaken as soon as the ice broke on Lake Champlain, the first brood fish being captured on April 6, and by the 13th of April 4,057 large female and 1,553 male pike perch had been assembled in the pens. In view of the very low water level in the lake it was considered unsafe to carry a larger number, hence further seining was deferred until the 17th, when an effort was made to secure additional male fish. Within a few days after the work started it became necessary to release over 1,000 of the females, as the crowded condition of the pens and the low stage of the water were causing the development of fungus. Eggs were taken between April 15 and April 29, the total for the season amounting to 170,720,000. As a result of an actual count of green and eyed eggs during the first days of the season the eggs were estimated to run 110,000 to the quart. Formerly 150,000 eggs to the quart was the measure used.

Incidental to the pike perch work, 29,300,000 yellow-perch eggs were collected from the marshes in the vicinity of the hatchery. Practically all of these produced fry, some of which were supplied to applicants. Collections of eggs of this species at the Swanton substation are limited only by the space and facilities available for their development.

BRYANS POINT (MD.) SUBSTATION

[L. G. HARRON, Superintendent]

During the first half of March the Bryans Point station was engaged in assembling a brood stock of yellow perch as a source of egg supply for the hatchery. As the season's catch of this species by the Potomac River fishermen proved to be very small, only 6,047 could be secured, less than one-third the number handled at the station in the previous year. These fish spawned in live boxes between the 15th and the 27th of March, yielding 48,875,000 eggs. On attaining the eyed stage, 5,850,000 were shipped to central station, Washington, D. C., and 34,420,800 fry were developed from the remainder and liberated on the spawning grounds in the Potomac River.

Observation has shown that the great and growing scarcity of yellow perch in this region may justly be attributed to the present extensive use of fyke nets. Many of the fishermen are employing what is known as the sunken fyke, a device consisting of a string of from 10 to 25 nets in a line, no part of them being visible above the surface of the water. These are spread out from shore to shore, not only on the river flats but in tributary streams, and as they are in operation practically throughout the year, their destructive effects are only too apparent. For discussion of the collection of shad eggs see page 475.

RESCUE OPERATIONS

Homer (Minn.) Station and Substations

[C. F. Culler, in charge]

With the Homer (Minn.) station as a central directing base, fish-rescue operations were conducted during the summer and fall on the Mississippi River bottoms lying between Prescott, Wis., on the north and Andalusia, Ill., on the south. Owing to unusual natural conditions the results of the work were much smaller than the average returns of recent years. Activities extended from early July to the close of November, which period was marked by exceptionally cold, wet weather, the late spring and frequent rains maintaining the ponds and sloughs in a fresh state and preventing any material shrinkage of the water area. While not conducive to large collections, this situation constituted a favorable environment for young fish, the unusually wide range affording them ample feeding grounds, while large numbers were able to find their way into the main channel of the river. All rescue areas previously occupied were thoroughly worked, but, as in past years, an extensive amount of fruitful territory remained uncovered because of lack of funds, though several new fields might have been established had it been possible to foretell what the weather would be when the season opened.

On account of their more elevated location and the consequent lowering of the water at a comparatively early period, the fields in the vicinity of the Homer station and at Genoa, Wis., were the most productive, the former alone yielding nearly half the total of the season's returns. Rescue work in cooperation with the Wisconsin fisheries authorities having been contemplated in the vicinity of Lynxville, Wis., two crews were sent by the State to cover that territory in the latter part of July. However, heavy rains interfered with successful work and the field was abandoned early in August. Along the upper river 62,220,565 fish were rescued, this number being less than half the total of the preceding year. All of the rescued fish were released in the Mississippi River and its adjacent tributaries with the exception of approximately 911,000 reserved for delivery to applicants.

The season's mussel-infection work resulted in the release of 1,783,561,850 glochidia of the commercial fresh-water mussels on suitable host fishes, this number exceeding last year's total by approximately 500,000,000.

La Crosse (Wis.) substation.—A new 2-story hatchery building, 85 feet long and 50½ feet wide, was recently constructed at this point on land acquired from the city of La Crosse. In addition to the hatching room, which is equipped with a sufficient number of galvanized-iron hatching and retaining troughs to handle approximately 2,500,000 eyed trout eggs, the lower floor of the building contains an aquarium and an office. Part of the space on the upper floor is utilized for a carpenter shop and the remainder is fitted up as sleeping quarters for the station employees.

During the winter of 1924–25, 763,400 eyed brook-trout eggs were acquired, part of them from Cedar Island Lodge at Brule, Wis., and the remainder from a commercial dealer in that State. The substation also handled 371,000 rainbow-trout eggs transferred from other stations of the bureau, and approximately 96,000 eggs of the Loch Leven trout from the Madison Valley (Mont.) field. All of these were successfully incubated and the resulting fry carried to the fingerling stage with an aggregate loss of less than 25 per cent.

Bellevue (Iowa) substation.—The territory included in this field extends from Dubuque to Green Island in the State of Iowa. Due to high water, the output of rescued fish was greatly reduced as compared with that of the preceding year.

Atchafalaya (La.) substation.—The season's work at this station began on February 14, when preliminary arrangements for the propagation of buffalo fish were begun. The earliest eggs were obtained on March 7 and the latest on March 24, the total amounting to 140,400,000. Owing to the flooded condition of the Ouachita River and the consequent pollution of the local water supply, the eggs could not be developed in the Atchafalaya hatchery and most of them were planted on the spawning grounds immediately after fertilization had been accomplished. A few millions, reserved with the object of testing the water supply at a new site on the Bayou Plaquemine, were successfully incubated at that point with only a 2 per cent loss, and the resulting fry were vigorous and healthy. On account of the higher water temperature at the new site, the incubation period is materially shorter than at Atchafalaya.

Mussel Infection in Conjunction with the Rescue of Landlocked Fishes

[H. L. Canfield, in charge]

As in past years, mussel-infection operations were conducted in connection with the salvage of food fishes from overflowed lands along the Mississippi River. This work is receiving the hearty commendation of practically all who are engaged in the various branches of the mussel industry, including clammers, buyers, and pearl-button manufacturers, and many of them have expressed their approval in writing.

While weather conditions during the summer and fall of 1924 were unfavorable for the prosecution of the rescue work, they were in the main favorable to infection operations. This is explained by the fact that only strong, vigorous fish can be used to advantage in the infections, and during protracted warm periods most of the fish handled are so soft that they will not successfully endure the treatment.

The first five-year term of the mussel closure law in force along the Mississippi River and its tributaries in Wisconsin, Minnesota, Iowa, and Illinois having expired, the areas in which it was applicable are now open, while other areas will be closed for a second period of five years. No definite data as to the effects of this law will be available until the close of the second period, but judging from current reports it is believed it has proved beneficial.

The fields in which mussel-infection operations were conducted during the year and the numbers and species of mussels handled in each are shown in the following table:

Summary of infection of fishes, fiscal year 1925

Stations	Species		
	Grass mucket (*L. luteola*)	River mucket (*L. ligamentina*)	Pocketbook (*L. ventricosa*) [1]
Prescott, Wis		4, 330, 500	
Wabasha, Minn		3, 374, 000	
Winona, Minn	257, 121, 000	236, 143, 500	
Homer, Minn	159, 944, 500	431, 238, 000	
Dakota, Minn		95, 972, 500	
La Crosse, Wis	22, 127, 500		
Genoa, Wis	84, 590, 000	136, 810, 000	3, 300, 000
Ferryville, Wis	11, 500, 000		
Lynxville, Wis	38, 185, 000	36, 405, 000	
Marquette, Iowa	265, 500	4, 713, 000	
Guttenberg, Iowa	50, 245, 000	2, 633, 000	
Bellevue, Iowa	18, 358, 250	57, 128, 100	
Andulusia, Ill		129, 177, 500	
Total	642, 336, 750	1, 137, 925, 100	3, 300, 000

[1] This mussel is not of best quality and fishes are infected with it only when first-class mussels are not available.

MARINE FISHES

A very successful season was experienced in the propagation of the marine fishes of the New England coast. The eggs collected at the three stations comprising this group aggregated 4,886,182,000, as compared with 4,049,135,000 in the preceding year, while the output of eggs and fry amounted to 4,092,807,000, a gain of about 13 per cent compared with corresponding figures for 1924. The heavy increase shown is accounted for by the phenomenal abundance of cod in fields around Gloucester, Mass., and by an unusually heavy run of winter flounder along the Maine coast.

BOOTHBAY HARBOR (ME.) STATION

[E. E. HAHN, Superintendent]

As in recent years, fish-cultural operations at this station were confined to the propagation of winter flounder, a careful watch maintained by the station force on all fishing grounds in the vicinity having failed to disclose any source of supply for cod, haddock, mackerel, or alewife eggs. On March 1 the work of obtaining brood winter flounder was taken up by the steamer *Gannet* and two smaller vessels, 88 fyke nets being set in numerous coves and harbors over an area extending from Penobscot Bay to Casco Bay. Of these, 46 were operated by the *Gannet* and its crew while the station force in the smaller boats tended the remaining nets. Collections were discontinued on May 11, 9,203 breeders having been secured. The number would have been much larger but for the occurrence of an accident at the height of the season. While operating nets in Casco Bay the steamer's skag was carried away in a gale, necessitating the withdrawal of the boat from the field for two weeks while a new skag was cast and installed. The captured fish provided 2,027,901,000 eggs, establishing a record far better than that of any season in the station's history. The fish were held in tanks in the hatchery pending the full development of the eggs when they were stripped and immediately liberated in the station harbor. At one time during the spawning season eggs were taken in such numbers that the hatchery was filled to overflowing and a large surplus had to be held in floating boxes installed in the harbor until the development of older lots of eggs provided hatching space for them.

On the completion of fish-cultural activities a supply of local fishes, seals, and Crustacea was collected with the view of providing the usual summer aquarial display, 25 tanks arranged in the hatching room being used for the exhibit. This feature of the work is of great interest to the many daily visitors to the hatchery.

GLOUCESTER (MASS.) STATION

[C. G. CORLISS, Superintendent]

Reports having been received late in October that ripe pollock were being taken in large numbers near Plymouth, Mass., employees from the Gloucester station were sent out some days in advance of the usual time to make collections. The first eggs were taken on October 28, and between that time and the close of spawning operations on the 7th of January, 430,648,000 had been secured. Over 90 per cent of these were derived from gill nets operating around Plymouth and Duxbury, the fisheries off Cape Ann yielding only comparatively few. During the first three weeks of the season the eggs were, from some unknown cause, inferior in quality, and the losses during incubation were large. As a result of the work with this species 222,890,000 fry were hatched and planted in the coastal waters of Massachusetts.

The results of the year's work in cod propagation were the best in the history of the station. The egg-collecting season was a long one, extending from shortly after the middle of November to nearly the close of the third week in May. The first eggs were secured incidentally, in occasional small batches, with pollock spawn. As soon as the pollock work ended the energies of the station force were concentrated on the cod work. However, the results during January were poor, owing to stormy weather, but from the beginning of February to the close of the spawning season natural conditions were generally favorable and the egg receipts during that entire period were very large. Up to the first of April all eggs taken were brought to the hatchery and incubated, but subsequent to that date the low water density (resulting from spring freshets) necessitated the fertilization and immediate planting of all eggs on the spawning grounds. Of the total collections, amounting to 1,219,468,000 eggs, over one-third were incubated and the resulting fry liberated off Cape Ann and adjacent points. The Woods Hole (Mass.) station was furnished 1,750,000 green eggs for experimental work, and the remaining eggs were planted.

Haddock propagation was taken up late in March and prosecuted in connection with the cod work. The daily catch of haddock being small, the fishermen soon became discouraged and transferred their attention to the more remunerative cod, thus reducing the supply of eggs. Nearly all of the 174,603,000 secured during the season (extending from March 20 to May 16) had to be planted as soon as fertilized, owing to unsuitable water conditions in the hatchery.

During the first week in March fyke nets for the capture of a brood stock of winter flounder were set in the outer harbor near Gloucester and 336 gravid fish were taken, the catch being nearly twice as large as that of last year. These fish yielded 199,258,000 eggs for incubation.

In the conduct of the so-called "offshore" work, prosecuted under the direction of the superintendent of this station, experienced spawn takers are detailed to accompany the fishing fleet to the Georges Bank fisheries to take eggs from the ripe fish caught for the market, fertilize, and plant them on the fishing grounds. During the past season this work was in progress from February 5 to April 7, and resulted in the planting of 137,355,000 fertilized cod eggs and 42,222,000 fertilized haddock eggs.

WOODS HOLE (MASS.) STATION

[W. H. THOMAS and G. R. HOFFSES, Superintendents]

Well in advance of the spawning season the customary arrangements for securing adult cod were made with trap fishermen at Newport and Narragansett Pier, R. I. It was expected that enough brood fish to serve as an egg supply for the hatchery could be obtained at these points, but inclement weather prevented the fish from entering the traps in substantial numbers. By the middle of November, however, a sufficient number had assembled and were being held in pens for transfer to the hatchery. Not having a boat fitted for carrying live fish, the station is dependent upon the charter of fishing vessels equipped with wells, and as a boat of this kind is available only at the convenience of the owner, arrangements for the immediate transfer of the fish were impossible and before the required facilities could be provided the violent storm of November 22 and 23 destroyed the inclosure and released the fish. The fishermen's equipment was so seriously damaged by the storm that the owners concluded it would not be profitable to repair it for further work, as weather conditions in that locality rarely permit trap fishing much beyond the date mentioned. With the close of cod fishing and the loss of all fish previously taken, the possibility of securing a brood stock for the station failed. The circumstances described and their practical duplication during the preceding year present a most convincing argument in support of the station's need for a boat suitably equipped for the carrying of live fish.

Quite satisfactory work in the propagation of winter flounder was made possible in the Waquoit (Mass.) field by the generally favorable weather prevailing throughout the spawning period. Operations were undertaken there on February 1 and vigorously prosecuted until April 11, during which time 584,000,000 eggs were secured, 90 per cent of which produced good fry. At one time when the entire hatching space was filled to capacity some 4,500,000 eggs were planted on the spawning grounds immediately after being fertilized. On March 20, when the collection of eggs of this species was undertaken at Newport, R. I., natural conditions appeared to be entirely favorable, the mild weather permitting regular visits to the nets, and fish of large size being plentiful. Notwithstanding these advantages, the outcome of the work was disappointing, only 42,820,000 eggs being secured. The failure to produce adequate results was due to arrested development of the eggs in the fish. Such eggs were not voided and attempts to take them by artificial means were unsuccessful. While the reason for this trouble is not understood, it is presumably due to injuries sustained by the fish during handling, and is accentuated by holding them in a restricted environment. The ovaries of the fish are unduly distended, which under normal conditions gradually become softer to the touch with the approach of maturity. A fish thus affected seems unable to extrude its eggs and eventually dies.

In the course of the season new methods were tested in an effort to devise means for the safe transportation of brood winter flounder to the Woods Hole station. Owing to the peculiar nature of this fish, experience has shown that it can not be carried to advantage in the 10-gallon transportation cans in general use by the bureau. If some method can be evolved whereby adequate numbers of the adult fish can be delivered in good condition at the hatchery it will probably go far toward eliminating the difficulty referred to and will obviate to a great extent the heavy losses that appear to be unavoidable under the present methods of conducting the work. In addition to the eggs mentioned, upward of 24,000,000 were obtained from commercial fishermen operating at Menemsha Pond and other points in Marthas Vineyard Sound. Eggs taken by incision from a few fish late in the season were readily fertilized and successfully incubated, and it is possible that this method may have to be more extensively resorted to hereafter.

During the spring mackerel appeared to be abundant in local waters and throughout the spawning season the one small boat available was in constant attendance on such traps as could be reached, with spawn takers to secure all available eggs. As a result of these efforts 3,517,000 eggs of good quality were taken and incubated. Advantage was taken of the opportunity afforded to attach tags to a considerable number of adult mackerel, in continuance of the rather extensive fish-tagging program recently inaugurated by the bureau. Scup, another highly important food fish, was also present in fair numbers, though none containing ripe eggs was found in the traps visited. If a suitable boat had been available for the prosecution of the work it seems certain that many more mackerel eggs and quite probably eggs of the scup in considerable numbers might have been salvaged.

Some 50,000 eggs of the steelhead salmon were received in May from the Applegate Creek (Oreg.) substation. The consignment arrived in rather poor condition, a considerable number of the eggs having hatched on the trays en route. The surviving eggs were successfully incubated and the resulting fish were distributed in various tributary streams of Johns Pond, Waquoit, Mass.

ANADROMOUS FISHES OF THE ATLANTIC COAST

Fish-cultural work with fishes of this class is conducted at three stations, located in Maryland, North Carolina, and Maine. The species handled are the shad, river herrings, and Atlantic salmon. The general results of the work in 1925 did not vary materially from those of the preceding year.

Shad

Bryans Point (Md.) substation.—Though weather conditions throughout the winter and early spring were favorable to a good run of shad, the fish failed to appear in any considerable numbers and the catch made by the Potomac River fishermen proved the smallest ever recorded. Overfishing and a total lack of protection are undoubtedly responsible for this falling off. In the course of the spawning period (from April 16 to May 18) small daily collections of eggs were made, aggregating 26,270,000 for the season. In accordance with the policy heretofore pursued, no eggs were measured or paid for until the second day after their receipt at the hatchery, thus obviating the possibility of paying for defective eggs and insuring a large percentage of hatch. Seven hundred thousand eggs in the eyed stage were shipped for development in the central station (Wash.) aquarium, and 16,678,671 fry were hatched from those retained. Five hundred thousand of the fry were furnished to the Connecticut State Board of Fisheries and Game, and the remainder were released on the natural spawning grounds, being divided equally between Maryland and Virginia waters.

Shad and River Herring. Edenton (N. C.) Station

[Wm. S. Vincent, Superintendent]

The two anadromous fishes of commercial importance handled at this station are shad and river herring. Though the station was established primarily for the propagation of shad, this work has gradually declined in volume and is now of minor importance, owing to the growing scarcity of shad in the Albemarle Sound region.

At the opening of the spring fishing season it was anticipated that a goodly number of shad in spawning condition might be secured at the Capehart Beach fishery, but this hope proved futile. Only 2,000 fish were taken, as compared with a catch of 12,000 the preceding year, and after endeavoring for 10 days to obtain eggs the work was finally abandoned. The total collections of eggs during this period amounted to only 502,000. A discouraging feature of the work was the difficulty of obtaining male and roe shad at the same time. The morning catch was very apt to consist almost entirely of males, while in the evening conditions were usually reversed.

Large numbers of river herring were captured during the spring, and commercial fishing for that species proved more profitable than in many years; more eggs were therefore taken for propagation than in any previous season since the Edenton station was established, the total exceeding 336,000,000. The percentage of fertilization was very low, however, owing to unusual adhesiveness of the eggs, and only about half of the collections was hatched. Every known method was employed to overcome the adhesiveness, among these being the use of muck and starch, taking the eggs at different periods of the day, feathering, etc., but all to no purpose. An apparently plausible theory was advanced by some of the fishermen to account for the faulty condition of the eggs. The almost total lack of rain during the spring caused the water in the river to drop to a very low stage at spawning time, when as a general thing very muddy, high water may be looked for during this period, and the fishermen were of the opinion that lack of sediment in the water may have been responsible for the failure of the eggs to develop as usual. In past seasons many schools of young herring have been observed near the docks and fish houses. Last season, the schools were late in appearing and their numbers were greatly reduced, seemingly justifying the assumption that the percentage of hatch under natural conditions was also below normal.

About 400 brood yellow perch, purchased early in the spring from local fishermen, were held in one of the station ponds. After the fish had spawned, the eggs were gathered up in small dip nets and developed in hatching jars. The percentage of fertilization was high and incubation was accomplished with a loss of only 5 per cent. The resulting fry were utilized to supply applicants and make plants in public waters.

Atlantic Salmon. Craig Brook (Me.) Station

[J. D. De Rocher, Superintendent]

In view of the continued antagonistic attitude of the salmon-weir fishermen as regards the collection of Atlantic-salmon eggs in Maine rivers, no effort was made to procure a brood stock of that species. The small number of Atlantic-salmon fry on hand at the beginning of the fiscal year was carried to the No. 2 fingerling stage and then liberated in Dead Brook and Dennys River. Early in March two consignments of eggs of this species were received from hatcheries operated by the Canadian Government, one of 1,000,000 eggs coming from South Esk, New Brunswick, and another of 500,000 from Gaspe, Province of Quebec. Approximately 954,000 fry were hatched from the first lot, while the second produced more than 490,000. The fish were distributed in the advanced fry stage, plants being made in the Penobscot, Piscataquis, Salmon, Pleasant, Dennys, St. Croix, and Narragaugus Rivers.

FISHES OF MINOR INTERIOR WATERS

The ever growing demands for fish and fish eggs of practically all of the game species propagated by the bureau are making it increasingly difficult to keep pace with them. Of late years the expansion in this direction has been greatly intensified by the wide use of the automobile as a means of travel, and by the building of roads into hitherto inaccessible regions, thereby opening up to public fishing and subsequent depletion many waters that formerly contained fish in abundance.

Among the fishes most frequently called for are the rainbow trout, brook trout, black basses, rock bass, sunfishes, and crappie. Thus far it has been possible to produce the rainbow trout in quantities adequate to meet the requirements, but in the case of the brook trout the dwindling supply of wild fish has necessitated reliance upon commercial trout-culturists for a large percentage of the eggs needed for stocking the bureau's hatcheries. During the past year the demands for practically all of the pondfishes have been entirely out of proportion to the available supply, and in its efforts to cope with the situation, both as regards the pondfishes and the brook trout, the bureau has endeavored to enlist the active cooperation not only of the State fisheries authorities but also of many prominent fish and game associations on a scale never previously attempted.

Aside from unpropitious weather conditions, the principal obstacle encountered in the pondfish-cultural work is lack of sufficient rearing space. In an effort to overcome this deficiency the bureau is endeavoring to secure the use of land and water facilities at the command of numerous clubs and fishing organizations for the conduct of rearing operations on an equal share basis. Its efforts in that direction have thus far met with a most encouraging response. A number of cooperative projects have been undertaken, and in some cases organizations have volunteered to construct ponds and troughs at their own expense with the view of rearing young fish, furnished by the bureau's hatcheries, to the fingerling size before liberation in open waters. The influence of such organizations has also been beneficial in securing more effective State fisheries legislation and in developing respect for fish protection on the part of the general public.

ROCKY MOUNTAIN TROUT STATIONS

The eight stations and substations comprising this group are among the more important of those whose activities are confined to the production of game fishes. The aggregate distributions of fish and eggs of the brook, rainbow, black-spotted, and Loch Leven trouts and the grayling made by these stations compare favorably with their output in previous years.

Bozeman (Mont.) Station and Substations

[W. T. Thompson, Superintendent]

The results of the year's fish-cultural work in this field (the most successful the station has ever experienced) are in a large measure attributable to the close cooperative relations that have existed between the bureau and the Montana Fish and Game Department. Since its recent reorganization, this department has rendered valuable assistance to the station in its work of stocking the numerous waters throughout the State of Montana.

Bozeman (Mont.) station.—The distribution of the large stock of fingerling trout on hand at the opening of the fiscal year was made by one of the bureau's distribution cars, the work extending from early July to the close of November. During this period 1,074,840 brook trout, 312,000 rainbow trout, 155,511 Loch Leven trout, and 9,100 lake trout of various sizes were delivered to applicants or planted in public waters. The losses sustained while the distribution was in progress aggregated 143,160 fish, or slightly less than 11 per cent of the original stock.

Of the 1,606,300 black-spotted trout eggs received early in the fiscal year from Yellowstone Park, 310,000 were turned over to the district national forester to be planted in the distant and almost inaccessible waters of the Lolo and Missoula National Forests. From the remainder 1,270,000 fry were hatched, these, in addition to the young fish on hand at the beginning of July, giving the station a total of 1,473,000 black-spotted trout. All of this stock was distributed in the advanced fry and fingerling stages by the car that was engaged in the shipment of fingerling trout of other species.

During the fall and winter the station acquired over 1,000,000 brook-trout eggs, 500,000 of which were forwarded from the Springville (Utah) station, an equal number from the Leadville (Colo.) field, and 100,000 from the establishment of the Southside Sportmen's Club of Oakdale, N. Y., the latter being a donation in recognition of the service rendered by the station in securing from the State of Montana a consignment of grayling eggs for the club's hatchery. There were also obtained 67,600 eggs from a small stock of brood brook trout carried in the station ponds. The losses on some of the eggs were above normal, notably on the consignments from the Utah and Colorado fields, which sustained a mortality in the egg and early fry stages of 152,000 and 190,500, respectively. The eggs from Leadville were unusually small in size, and the losses were largely increased by the fact that the eggs were practically at the hatching stage when received. The product of this lot was distributed during the spring, but the fry resulting from the Utah consignment were being carried at the close of the fiscal year.

In November and December several shipments of Loch Leven trout eggs, aggregating 1,393,000 eggs in round numbers, were received from the Meadow Creek (Mont.) auxiliary. Of these, 598,000 were immediately repacked and shipped on assignment. The remainder produced 509,000 fry, some of which were distributed in May and June. A small lot of landlocked-salmon eggs, received in March from the bureau's Craig Brook (Me.) station, was successfully incubated. It is the intention to plant the young fish of this species in a lake in Montana in the hope of being able eventually to develop a collecting field for eggs. The incubation of 1,391,000 rainbow-trout eggs received from the Madison Valley field was completed during May and June, the losses in hatching amounting to slightly more than 4 per cent.

Meadow Creek (Mont.) substation.—Preparations for the season's fish-cultural operations in this field began in September with the installation of traps at several points in Odell Creek for the capture of Loch Leven trout. While good weather lasted large collections of eggs were made every day between October 13 and November 15, on which date the work was brought to a sudden close by the weather turning cold. Of the 11,750,840 eggs obtained, approximately 90 per cent were shipped in the eyed stage, some for supplying applicants and some in exchange for eggs of other species.

The rainbow-trout spawning season in this field opened on March 20, fully two weeks in advance of any previous season since the station was established. Eggs were obtained daily from that time until May 21, 3,991,000 of exceedingly fine quality being secured. A considerable number of rainbow trout and numerous grayling were captured in several experimental traps installed in various channels of the Madison River near the head of Meadow Lake. Their eggs were not mature, however, and the current was too swift for the retention of the fish in pens to ripen. Approximately 50 per cent of the fry resulting from the collections were released in parent waters, the Madison Valley Anglers Club and the deputy State warden of Montana assisting in the distribution.

In pursuance of an arrangement effected with the Montana fisheries authorities, whereby the resulting fry were to be liberated in Meadow Creek and other waters in the Madison Valley, this substation incubated in excess of 5,220,000 grayling eggs and 990,000 black-spotted trout eggs and planted the product.

Glacier Park (Mont.) substation.—After carrying to the fingerling stage the 342,000 rainbow-trout fry on hand at the beginning of the fiscal year, the product was turned over to the local park authorities for distribution in the waters of Glacier Park. A consignment of 484,000 eyed black-spotted trout eggs was received in July, 1924, about half of which were planted in some of the more distant and inaccessible waters near the top of the continental divide. The remainder were incubated and the product planted as fingerling fish in park waters.

During the spring of 1925, 551,000 eyed rainbow-trout eggs were received from the Meadow Creek field. These were hatched with a small loss, leaving approximately 537,000 fry in the hatchery at the close of June. Green black-spotted trout eggs to the number of 940,380 were received early in June from the Georgetown hatchery of the Montana Fish and Game Department, with the understanding that an equal number would be returned to the State from the Yellowstone Park collections later in the season. About the same time 1,027,000 green grayling eggs were received from the State in exchange for Loch Leven eggs to be supplied later.

Leadville (Colo.) Station

[C. H. Van Atta, Superintendent]

The work at this station is concerned mainly with the production of brook trout. It differs from that at most of the other brook-trout stations in that the supply of eggs is derived almost entirely from collections made on a share basis from privately owned lakes and reservoirs. From five projects located within a radius of about 150 miles from the station over 6,000,000 brook-trout eggs

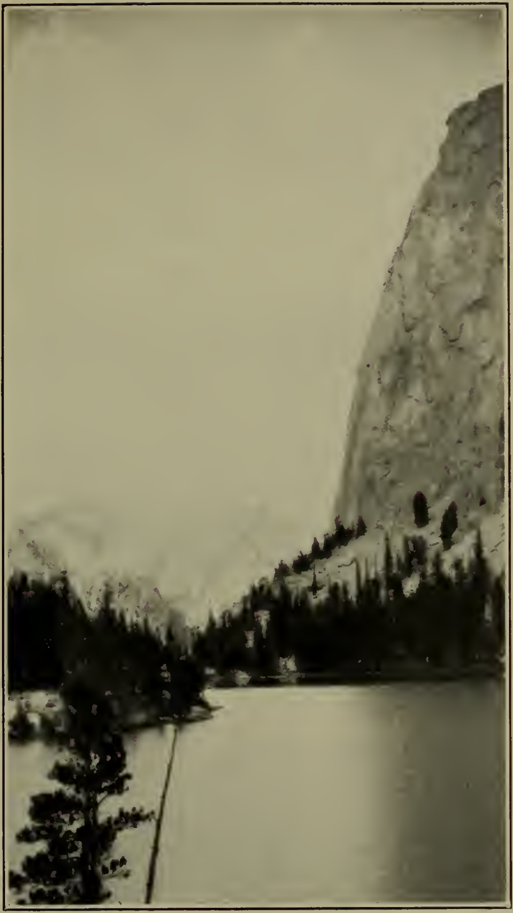

FIG. 3.—Virgin lake in the Sawtooth National Forest, Idaho. Elevation 9,000 feet

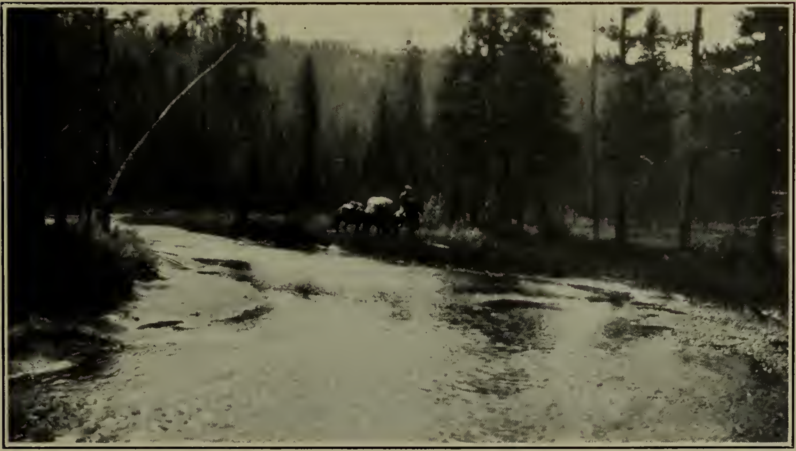

FIG. 4.—Pack outfit on the meadows of Hell Roaring Creek, Sawtooth National Forest, Idaho. Typical of the meadow streams in the region

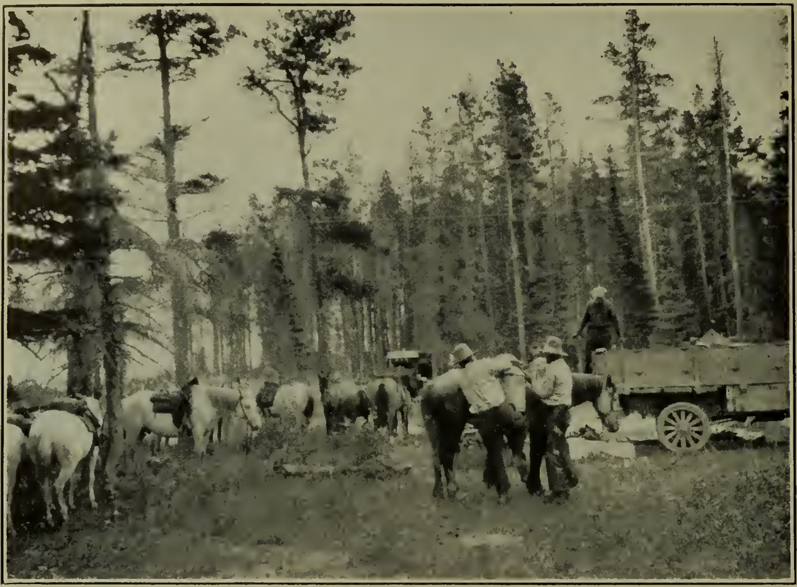

FIG. 5.—Loading pack horses, Glacier National Park

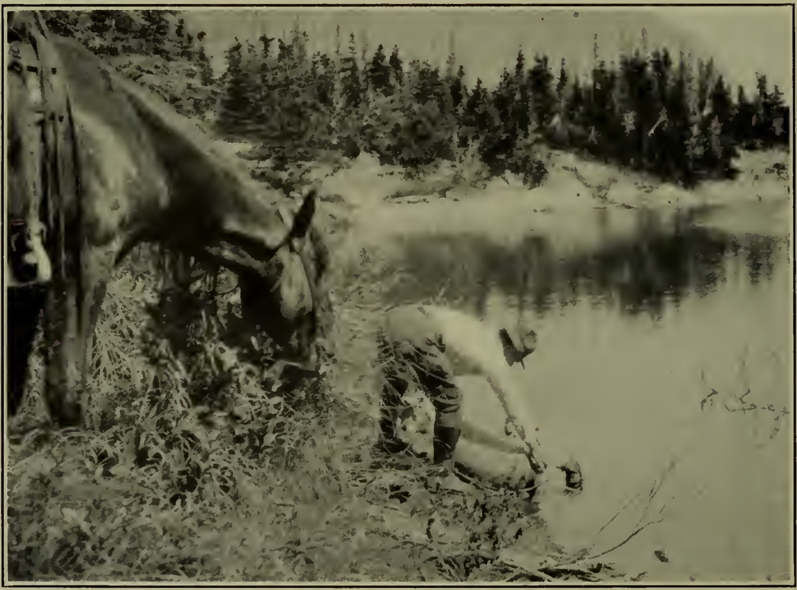

FIG. 6.—Forest ranger planting fish, Glacier National Park

were obtained in the fall of 1924 at an average cost of 7 cents per 1,000. Among the most prolific is the property known as the Engelbrecht Lakes, consisting of two inclosures of 50 and 80 acres, fed by a small creek. While egg collecting is in progress the owner of these lakes furnishes board and lodging to the bureau's spawn takers and receives as his part of the proceeds 30 per cent of the eyed eggs and fry.

The Mount Massive Trout Club holdings comprise a group of 20 lakes, ranging in area from 1 acre to 18 acres, the series being fed by a ditch leading from a neighboring creek. The work here is conducted on an equal share basis. A third collecting point is Turquoise Lake, a reservoir of approximately 800 acres owned by the Colorado Fuel & Iron Co. Due to the fact that this lake was drawn down about 18 feet below its normal level during the fall of 1924, laying bare the usual spawning area, there was a falling off in output of more than half a million eggs as compared with the results of the preceding year. Collecting projects of smaller extent are Carroll Lakes, two inclosures having a combined area of 20 acres, controlled by the Colorado Springs Fly-Casting Club, and a series of four, known as Wurtz Lakes, ranging in size from 1 to 5 acres.

In addition to the collections mentioned the station received 1,266,000 eggs from a privately owned fish-cultural establishment at Creede, Colo. In this case the owner of the plant made the collection of eggs at his expense, and in return for 50 per cent of the developed eggs the station assumed the care of the entire lot to the eyed stage and packed the owner's share for shipment to points directed by him.

In the course of the year the station acquired 162,200 rainbow-trout eggs, collected in Baker Lake, near Jefferson, Colo., and from the Evergreen Lakes on the station grounds. Eyed eggs of this species were also received from the bureau's Springville (Utah) and Saratoga (Wyo.) stations. From a consignment of 814,000 eyed black-spotted trout eggs, received from the Yellowstone Park, 801,000 No. 1 fingerling fish were produced and distributed. The station also handled 75,000 eyed lake trout eggs transferred early in March from the Duluth (Minn.) station.

Yellowstone National Park (Wyo.) Substation

[C. F. Culler, in charge]

The collections of eggs of the black-spotted trout in this field during July, 1924, amounted to 19,522,500. These were eyed in the bureau's hatchery near Lake Hotel, together with 12,477,500 taken earlier in the season. The unusually small water supply available for incubation work making it hazardous, if not impossible, to complete the development of this large stock, it was decided to utilize eyed eggs in larger numbers than heretofore for stocking the more distant and inaccessible waters of the park, especially since close observation had disclosed encouraging results from previous plants of eggs. No available means exist for transporting fry in large numbers to such waters, and even where the waters to be stocked are accessible by boat an excessive amount of time is involved in making the plant. Taking into consideration the number of streams where eggs are collected, it is estimated that fully 20 days would have been necessary to carry out the bureau's policy of returning to parent waters 25 per cent of the fry resulting from such collections, whereas the time spent in making this return in the form of eyed eggs did not exceed 4 days. Approximately 45 per cent of the product of the eggs collected was planted in the waters of the park either in the form of eyed eggs or as advanced fry. The remainder of the output, consisting of eyed eggs, was shipped to applicants and to other stations of the bureau.

Unusually high water obtained in all the park streams in the following spring from the time the station was opened—about the middle of May—up to the close of the fiscal year. This condition and the fact that ice-cold water in large quantities was flowing into the streams from adjacent mountains made a rather discouraging outlook for egg collections.

Saratoga (Wyo.) Station

[O. N. Baldwin, Superintendent]

Brook-trout operations were conducted as usual. Part of the 318,000 fingerlings of this species carried over from the hatch of the preceding year were distributed to applicants in the course of the summer, and the remainder was turned over to Forest Service officials to be planted in streams located within the forest reserve. A somewhat smaller number of eggs than usual was realized from the adult brook trout held in the station ponds and were of a lower grade than those of the preceding year, the percentage of hatch amounting to only 67. The unusually poor quality of these eggs is attributed to the fact that it became necessary to confine the brood stock in small concrete pools for an extended period prior to the spawning season. Satisfactory terms for the collection of brook-trout eggs in Big Creek Lakes, under the control of the Big Horn Cattle & Improvement Co., having been effected with the new manager of the company, spawning operations in that field were undertaken on October 8 and continued to December 11, resulting in the collection of 663,050 eggs of excellent quality. An equitable percentage of the fry hatched from this lot will be reared to fingerlings and returned to their native waters.

By a recent decision of the courts future fishing privileges in these lakes will be vested in the Forest Service, and when the property has been turned over to that service it will doubtless be possible, through the exercise of adequate protective measures, to develop a field station that can be depended upon to yield several millions of brook-trout eggs annually.

The rainbow-trout work in the Sage Creek, Canon Creek, and Lost Creek fields extended from April 22 to May 19. When the spawning season opened Sage Creek was at its normal level, the fish appeared to be running well, and all indications pointed to a record egg collection. About the middle of May, however, the work was brought to a sudden close by a heavy rain, which lasted for about 36 hours. In the course of the storm the débris, caused by the breaking of an irrigation dam a short distance above, came down in a solid body against the upper rack, destroying the trap and liberating a brood stock of approximately 800 fish confined therein. A small stream under natural conditions, Canon Creek usually yields approximately half of the rainbow-trout eggs collected in the Wyoming field. During the past season, however, the water was so low as to hardly cover the larger fish in the stream, and the thousands of cranes that annually visit this section inflicted heavy losses on the brood stock. Under existing conditions the eggs collected numbered less than 200,000. Owing to the more favorable water stage in Lost Creek a fairly successful season was experienced, and the total egg collections for the three fields aggregated 1,038,620.

Loch Leven trout eggs to the number of 201,560 were obtained during the fall from the station brood stock, which included a number of 2-year-old fish, and at the close of the fiscal year there were 155,000 fingerling fish of this species on hand. A shipment of black-spotted trout eggs, received from the Yellowstone Park late in July, was incubated with very little loss, yielding 320,000 fry for deposit in suitable waters of the region.

Among the many more important improvements made at this station during the year was the construction of a modern 5-room cottage for the use of the foreman and the installation of a Westinghouse 32-volt electric plant for lighting the hatchery and grounds.

Spearfish (S. Dak.) Station

[D. C. Booth, Superintendent]

Fish-cultural operations were conducted as usual, though on a somewhat enlarged scale. With the recent extension of the pond system, the stock of brook trout was considerably increased by the capture of fish in neighboring streams. Eggs of this species handled during the year included 365,000 taken from the station brood stock, 295,000 obtained by purchase from a commercial dealer in Massachusetts, and 500,000 transferred from the Leadville (Colo.) field. Fry resulting from this stock, to the number of 874,600, were distributed in the Nos. 1 and 1½ fingerling stages, and a small balance was on hand at the close of June.

The station collections included 37,255 eggs of the rainbow trout and 208,250 of the Loch Leven trout. Three hundred thousand additional Loch Leven trout eggs were shipped from the Bozeman (Mont.) station and 116,000 rainbow eggs were received from the Neosho (Mo.) and Saratoga (Wyo.) stations. All of these were of excellent quality and produced a good percentage of fry.

In the way of construction the station accomplished considerable. The extension of the pond area undertaken during the previous fiscal year was completed and a concrete reservoir of 425,000 gallons capacity was built. Water from this reservoir can be successfully used from six to seven times in succession, first in the hatchery and then in each of the ponds on the lower level of the reservation.

Springville (Utah) Station

[Claudius Wallich, Superintendent]

Fish-cultural operations at this station consisted mainly in the propagation of brook, rainbow, and black-spotted trout, though they included also the capture of a limited number of catfish in Utah Lake for filling applications submitted by residents of the State of Utah.

The work of collecting brook-trout eggs in the Fish Lake field, conducted in cooperation with and under the direction of the Utah fisheries authorities, was taken up November 6, at least 12 days after spawning began, as reported by the forest ranger of that district. The delay occurred because the State officials were not prepared to enter the field at an earlier date. Over 1,000,000 eggs were taken in the first day's operations and later collections were good, though maximum results were not attained owing to the decision of the State operatives not to make daily collections. The last eggs of the season were taken December 3, the total yield being approximately 3,500,000, of which the bureau's share was 1,341,000. Of the 950,000 eggs eyed from this lot, 500,000 were shipped to the Bozeman (Mont.) station. The remainder were incubated, and most of the resulting fry were used in filling applications and making public plants in suitable waters in Utah. In this connection an equitable proportion of the output was returned to the waters of Fish Lake.

At the beginning of the fiscal year there were on hand 60,000 fingerling rainbow trout No. 2½ and 507,000 fry, the latter being the product of spring collections of eggs in Fish Lake. Excessive losses, probably due in part to the use of fertilizing medium from black-spotted trout when the stock of male rainbow trout was inadequate, reduced the output of this lot to 295,050 fingerling fish. Eggs were taken from the brood rainbow trout held in the station ponds between December 11 and February 25, the returns aggregating 988,370. Owing to imperfect fertilization only 574,000 of these were developed to the eyed stage. During April and May, 1925, collections of eggs of this species were made at Fish Lake under the direct supervision of the State authorities, and of the 21 cases of eggs secured the station received 4 cases containing 700,000. The percentage of fertilization on these was also low, only about one-fourth of them surviving to the eyed stage. The returns from cooperative black-spotted trout work along the same lines at Strawberry Reservoir, Utah, were 3,000,000 eggs, of which the station received one-tenth, or 300,000. These were of such poor quality that nearly two-thirds of them perished before the end of June.

NEW ENGLAND TROUT AND SALMON STATIONS

Included under this head are the stations located at Hartsville, Mass., Nashua, N. H., East Orland, Me., and St. Johnsbury, Vt., with their several auxiliary stations. The work of the group was concerned principally with the propagation of trout and landlocked salmon, though small numbers of other species were handled also. Their output as a whole slightly exceeded that of last year.

Berkshire (Mass.) Station

[W. H. Thomas, Superintendent]

From the stock of brook trout carried in the station ponds, consisting of 474 fish 2 years old and older, 264,700 eggs were secured at spawning time. With the consent of the proprietor, 45,000 eggs were collected from brook trout contained in a privately owned pond, and 165,300 were purchased from a commercial fish-culturist in Massachusetts. The fry from all this stock continued to develop normally up to March 11, when the loss on one lot began increasing rapidly and within four days had assumed epidemic proportions. Each lot of fry was similarly attacked on reaching a certain stage, and practically all the fish were lost eventually. Twice previously in recent years the station has undergone a like experience with its brook-trout fry, on each occasion after a heavy snow or rainfall. From the information that could be obtained it is believed that the losses were in some way connected with the entrance of surface water in large quantities into the intake pond. A noteworthy feature of the mortality is that the rainbow trout were not affected but continued to develop normally even when placed in troughs supplied with water from the troughs in which brook trout were dying in large numbers. This would seem to indicate that the disease is not infectious.

As an experiment, yeast and cod-liver oil were mixed with the ground liver fed to these fish, in the proportion of 2 parts yeast and 1½ of oil to 96½ parts liver; but it was soon discovered from the quantity of food left on the bottom of the troughs that the fish were rejecting the material, and it was observed that they were preying upon one another. Plain liver was substituted and was taken eagerly, nothing being allowed to accumulate.

Five hundred thousand pike-perch eggs were transferred during the spring from the Swanton (Vt.) station. They were of fine quality when received and the loss of 100,000 sustained during the incubation period is believed to have been due to the instability of the hatchery water supply.

During the month of May 45 adult smallmouth bass, furnished from the Cape Vincent (N. Y.) station, were apportioned among the breeding ponds. A few days afterward indications of nest building were noted, and at the close of the fiscal year 4 nests, estimated to contain 5,000 eggs, were observed.

Craig Brook (Me.) Station

[J. D. De Rocher, Superintendent]

An account of the year's work in the propagation of Atlantic salmon may be found on page 476 under the heading "Anadromous Fishes of the Atlantic Coast." The landlocked-salmon fry and fingerlings on hand at the beginning of the fiscal year—approximately 53,000—were reared to the No. 3 fingerling stage and released in suitable lakes in the region. From 70 adult landlocked salmon captured during November in trap nets set in Toddy Pond, 23,800 eggs were secured and incubated with 142,500 green eggs forwarded from the Green Lake substation. In February and March two shipments of eyed eggs of this species, aggregating 501,000, were received from the Grand Lake Stream auxiliary, and a consignment of nearly 200,000 was furnished the station by the State of Maine from its Caribou hatchery. In the course of the season the station shipped 160,200 eyed eggs, and 528,200 fry were hatched and liberated in the waters of Maine.

In January 1,149,000 eyed brook-trout eggs were purchased from commercial dealers in Massachusetts and New York, and a consignment of 53,000 was received from a Massachusetts dealer in exchange for eggs of the landlocked salmon. A good percentage of hatch was attained with both lots of the purchased eggs but the losses of fry were large, in the case of the Masachusetts consignment amounting to more than one-fifth of the original stock. All the young fish resulting from these two shipments were distributed in the advanced fry stage, while those derived from the exchange were on hand at the close of the year. The output of the station also included a few lake-trout fingerlings and fry, the product of eggs forwarded from its Grand Lake Stream auxiliary and the Charlevoix (Mich.) field.

Grand Lake Stream (Me.) substation.—At the opening of fiscal year 150,000 landlocked-salmon fry were being held in feeding ponds constructed in the canal formerly used for the passage of boats. They were fed from three to five times daily on sheep liver and beef heart, and when released, about the middle of September, they were fine active fish in the No. 3 fingerling stage.

The canal ponds are proving far superior to the trough-feeding system for the rearing of landlocked salmon. They not only require much less work but the losses are lighter, the fish are in better health, and attain a larger growth. Eggs of the landlocked salmon to the number of 1,096,700 were secured in November from 782 brood fish, which were captured by means of three crib nets and a trap installed in Grand Lake. The collection of eggs was larger than last year, when operations were conducted at both Grand and Dobsis Lakes, by approximately 112,000. On attaining the eyed stage 501,000 of the eggs were transferred to the main station. Plants of fry aggregating 273,250, part of the product of the remaining eggs, were made early in June in suitable local lakes, and the canal system was again stocked with 150,000 with the object of distributing them as fingerlings in the fall.

Owing to unfavorable weather and the difficulty of setting nets, the work of obtaining lake-trout eggs during October in the open waters of Grand Lake did not meet with much success, only 17,000 being secured. These were the yield of the four female fish captured, one of which weighed 30 pounds. The eggs were carried to the eyed stage with a loss of about 11 per cent.

Green Lake (Me.) substation.—Fish-cultural activities at this point were confined to the collection of eggs from the run of landlocked salmon in Great Brook. In the course of the spawning season (from November 9 to November 22) 249 brood fish were taken in the traps placed at the mouth of this stream, and from the 86 females contained in the lot 142,500 eggs of superior quality were secured and forwarded to the main station for development. As no hatching operations were possible, owing to the poor condition of the water-supply flume, the usual spring work in the propagation of smelt had to be omitted.

ST. JOHNSBURY (VT.) STATION AND SUBSTATIONS

[A. H. DINSMORE, Superintendent]

The main station at St. Johnsbury, and its two auxiliaries at Holden, Vt., and York Pond, N. H., were operated throughout the year. The principal activities at St. Johnsbury and Holden were connected with the production of brook trout for distribution in the advanced fry stage, while at York Pond the work was largely confined to the development of a project to serve as a future source of supply for trout eggs for stocking various hatcheries of the bureau.

St. Johnsbury (Vt.) station.—Owing to the high summer temperature of the water in Sleepers River, from which stream the hatchery water supply is drawn, this station is not equipped for trout rearing and its work with the Salmonidæ is limited to the production of fry for distribution just prior to the feeding stage. In the course of the year the station handled 500,000 eyed brook-trout eggs purchased from commercial fish-culturists, and, in pursuance of a cooperative arrangement with the owners of Darling Pond, Vt., approximately 742,000 brook-trout eggs collected in that body of water and transferred to the station without expense to the bureau were incubated on shares, the station receiving one-third of the resulting fry and turning back two-thirds to the owners. In addition to the above 400,000 eggs of this species, the property of two fish and game clubs of the region were incubated and the resulting fry placed at the disposal of the clubs to be planted by them in certain public waters. Small numbers of eggs of the landlocked salmon, steelhead salmon, and lake trout were also hatched and the product distributed to applicants of the bureau.

Holden (Vt.) substation.—Fish-cultural work at this point began with the collection of lake-trout eggs in Lake Dunmore in cooperation with the State of Vermont. The spawning period extended from October 24 to November 9, and 312,500 eggs were secured. On reaching the eyed stage 50 per cent of these were turned over to Vermont and about one-third of the remaining 50 per cent were forwarded to the St. Johnsbury hatchery. The remainder were incubated at Holden. Approximately 569,000 brook-trout eggs were handled during the season, including a lot of 200,000 purchased at the expense of a local fish and game association. The fry hatched from this lot were turned back to the association for liberation in public waters of the region.

York Pond (N. H.) substation.—The development work which has been in progress for several years in this field was continued as other operations would permit. The diversion ditch carrying water from Cold Brook through Sky and Bog Ponds into York Pond was enlarged so that it will now carry the entire normal flow from the brook. Work on the West Branch diversion ditch, begun in late November, was prosecuted as continuously as possible. Eventually this ditch will bring the West Branch water into York Pond through a swamp, which will form another pond about 5 acres in area. A water wheel designed by the bureau's architect and engineer was constructed and placed in position for operation, and a dynamo and transmission lines capable of furnishing sufficient power to light the station buildings and operate small machinery were installed.

During October and November 1,249 female brook trout were captured and spawned, yielding slightly more than 437,000 eggs. Approximately 69,000 of these were transferred in the eyed stage to the Holden substation, and from the remainder upward of 144,000 fry and fingerling fish were produced and distributed.

NASHUA (N. H.) STATION

[W. F. HUBBARD, Superintendent]

There was no departure from past methods in the conduct of fish-cultural work at this station. The total output of fingerling fish, amounting to approximately 470,000, was divided as to species among the brook, rainbow, lake, and Loch Leven trouts and the landlocked salmon. The station also incubated 1,000,000 eyed pike-perch eggs transferred from the Swanton (Vt.) hatchery, and distributed the product as fry. Eggs were obtained from the small brood stock of brook trout and rainbow trout, carried in the station ponds, between November 11 and January 14, the first-named species yielding about 28,000 and the rainbows slightly in excess of 125,000. This supply was supplemented by the purchase of 694,000 brook-trout eggs from commercial dealers in New England and the transfer of 53,000 rainbow trout eggs from the White Sulphur Springs (W. Va.) hatchery. There was a very heavy loss of fry resulting from one lot of the commercial eggs, the mortality amounting to nearly 50 per cent of the original stock. From approximately 23,000 landlocked-salmon eggs, shipped during the spring from the Craig Brook (Me.) station, 20,000 fingerling fish were produced and distributed. About the middle of June the station force undertook the collection of smallmouth-bass fry from Lake Sunapee for supplying applicants, but owing to the high winds, which prevailed almost continuously during the hatching period and until the schools of fry had dispersed, the attempt was almost a failure, only 28,000 being secured.

COMBINATION TROUT AND POND STATIONS

At these stations, located in the States of Iowa, West Virginia, Virginia, Tennessee, and Missouri, the fishes propagated included not only the various trouts but also several species of warm-water pondfishes. Fish-cultural activities of some kind are in progress throughout the year, which makes these stations very attractive to the general public. As compared with last year's results, the production of both trout and pondfishes was materially increased.

Erwin (Tenn.), Station

[A. G. Keesecker, Superintendent]

The species of fish propagated at this station during the past year included rainbow, Loch Leven, and brook trout, steelhead salmon, largemouth and smallmouth black bass, rock bass, and sunfish. The total distributions of fish and fish eggs exceeded those of the previous year by approximately 165,000. Between November 2 and January 6 the brood stock of rainbow trout yielded 647,700 eggs. Though the collection was considerably smaller than that of the previous year, the quality of the eggs was far superior, over 72 per cent being successfully eyed, as compared with less than 63 per cent in 1924. This improvement in fertility is attributed to the fact that a large part of the brood stock consisted of young fish that had been reared in earth-bottom ponds containing a plentiful supply of natural food. A consignment of 25,000 eyed rainbow-trout eggs taken from wild fish was received during the spring from the Meadow Creek (Mont.) field. The fry hatched from them will be reared for increasing the station brood stock of that species.

Four hundred and fifty thousand brook-trout eggs of good quality, received early in the winter from one of the commercial hatcheries in Massachusetts, yielded 386,750 No. 2 fingerling fish for distribution. The brood steelhead salmon held in the station ponds spawned between June 13 and March 24, yielding approximately 264,000 eggs. Their fertility was poor, only about 60 per cent surviving to the eyed stage and less than 30 per cent producing fry. In view of the unsatisfactory results attained it was decided to discontinue the propagation of the species and the brood stock was distributed by one of the bureau's cars during the spring.

The output of pondfishes was somewhat larger than in the preceding year, and at the close of June from 60,000 to 70,000 of the various species were being carried in the ponds for fall distribution. All buildings on the station grounds were painted during the year, this being the only improvement for which funds were available.

Manchester (Iowa) Station

[F. E. Hare, Superintendent]

On June 15, 1925, the Manchester station had the misfortune to receive the full effects of one of the severest rainstorms that has ever visited this region. The storm broke suddenly and with unparalleled fury, washing out roadways, bridges, retaining walls, and water-supply pipes, and covering the reservation with water to a depth of several feet. The large stock of brood rainbow trout, smallmouth black bass, and rock bass on hand in the station ponds was released by the flood waters into Spring Branch, though a considerable number of the fish were recovered later with seines and will be used as the basis for a new brood stock. In the hatchery, where fingerling brook and rainbow trout aggregating 627,000 were being held in troughs awaiting distribution, the entire stock was swept away, all, with the exception of the few lost on the grounds when the waters receded, being carried into the Maquoketa River and Spring Branch.

During the previous winter rainbow-trout eggs of fine quality were obtained from the station brood stock between December 9 and March 26, the total amounting to 1,076,000, or nearly twice the number collected the preceding year. On reaching the eyed stage 690,000 were shipped to applicants in five States. The remaining eggs were incubated in the hatchery, and the resulting fry were carried away during the flood, together with the product of 25,000 eggs from wild rainbow trout received in May from the Meadow Creek (Mont.) field.

Eight hundred and twenty thousand eyed brook-trout eggs were received from commercial dealers in exchange for eggs of other species, and 500,000 were transferred from the Leadville (Colo.) field. The fry resulting from the latter were among the fish carried away by the flood, but the majority of those hatched from the commercial eggs had been distributed previous to its occurrence. The year's output also included limited numbers of fingerling smallmouth bass and rock bass, the product of the spring spawning of the previous year. Hope had been entertained that a good showing might be made in the production of pondfishes in the spring of 1925, but all efforts along that line were nullified by the storm. All brood smallmouth bass and rock bass, together with an unknown number of fry, were released, the results of the spring work proving a complete failure. In the course of the year a considerable amount of improvement work on the hatchery and other buildings was accomplished, all of it being done by the station force.

NEOSHO (MO.) STATION

[F. J. FOSTER, Superintendent]

The year at this station was one of the most successful in its history. As in former years, fish-cultural activities were confined mainly to the propagation of rainbow trout and largemouth black bass, though considerable numbers of fish of other species were incidentally produced. In the course of the rainbow-trout spawning season (from November 1 to February 28) 1,357,160 eggs were collected, of which 696,000 in the eyed stage were consigned to applicants and other stations of the bureau. An outstanding feature of the work with this species was the material increase over past years in the number of large fingerlings produced, approximately two-thirds of the fingerlings distributed being in the No. 4 stage or larger. It is believed that the present policy of discarding practically all brood trout after their first spawning season is at least partially responsible for the marked improvement in the quality and quantity of the spawn collected, the comparatively large size of the fish distributed, and the low average cost of egg production, the latter item, based on the food consumed by the parent stock, amounting to 23½ cents per thousand, a reduction of 5½ cents as compared with its cost in the preceding year.

Though the health of the adult and yearling trout was generally satisfactory throughout the year, a constant and vigilant watch had to be maintained to prevent heavy losses of fingerling fish from the ravages of parasitic enemies. Monthly and often bimonthly treatments with vinegar solution were applied for the removal of gyrodactylus, and one trough of fry, still in the sac stage, became heavily infested with ichthyophthirius. As the fish at that time were still at the bottom of the trough, remedial measures were difficult to apply and fully half of this lot succumbed before the parasite could be eliminated.

The greatest loss experienced at this station continues to be from the affection known as crystals in the kidneys, which makes its appearance in fingerling fish from 1½ to 2½ inches long. There is ground for the hope that this trouble may be overcome, one reason being that the brood fish resulting from eggs shipped from the Madison Valley (Mont.) field two years ago have never been seriously affected by it; another is that the lot of fish experimentally fed on yeast and cod-liver oil continued in good health to the end of the season. Apparently the disorder is local as it has never been known to develop in fingerlings hatched from eggs shipped by the station to other points.

Early in the spring a new and peculiar disease, apparently of nervous origin, broke out among the rainbow-trout fingerlings, not only at the main station but also at the Bourbon auxiliary and at two private hatcheries in Missouri. Strong evidence of the disease was visible in some troughs while in other adjoining troughs there was not the slightest discernible trace of it. It invariably attacked fish of the same size—about 2 inches in length. Its presence was first made evident by a marked restlessness and loss of appetite and within a day or two afterward the slightest disturbance, even the passing of a hand over the trough, would cause the affected fish to go into convulsions, the mouth opening, the gills distending, and the fish pursuing a rapid darting and frequently a turning motion. Within a few seconds thereafter the diseased fish would sink to the bottom of the trough and die. The mouth closed at death and the gills became normal but the body invariably assumed a crescent shape as if the muscles along the lateral line on one side had contracted abnormally. If allowed to run its course, the duration of the disease was from a week to 10 days, terminating fatally. The treatment adopted was to darken the troughs on the first appearance of the trouble, carefully guarding against the slightest disturbance, and discontinue feeding for a period of 36 to 48 hours. At the expiration of that time the covers were carefully lifted and the fish fed lightly on clabbered milk, this diet being continued for two days. In the troughs subjected to this treatment the losses averaged less than 10 per cent, while the rate of mortality in the troughs where nothing was done to check the disease amounted to fully 50 per cent.

In its work with the pondfishes the station was quite successful, its output of fingerlings being more than 10 per cent in excess of the record of any previous year in its history. The importance of this statement is increased by the fact that over half the production consisted of black bass, for which there is such a heavy demand. The output of bass was four times greater than last year's, and exceeded that of any previous year by a substantial margin. The improvement in results, particularly as regards the bass, is attributed to a complete renewal of the brood stock preceded by a period of nearly a year when no bass were in the ponds, the purpose being to break the life cycle of the parasites which have in the past proved such a detriment to the pond work at this station.

Bourbon (*Mo.*) *substation*.—Very gratifying results were attained during the third year of operations at this point. A total of 1,304,170 rainbow-trout eggs was collected, nearly three times the total of last year, and its entire cost amounted to only $160.44. On reaching the eyed stage, approximately 748,000 of these eggs were distributed to applicants and to other stations of the bureau, while from the remaining stock nearly 60,000 fingerling fish were produced, more than half of them being 6 inches in length when distributed.

The health of the brood stock of rainbow trout remained good throughout the year, though considerable losses were sustained among the fingerlings owing to the development of crystals in the kidneys. The few parasitic attacks encountered were easily controlled by the application of vinegar baths, but no entirely satisfactory remedy could be found for combating the kidney affection.

Langdon (*Kans.*) *substation*.—In the conduct of work at this point greater difficulty than last year was experienced, owing to the larger number of ponds in operation and the scarcity of experienced help, the services of only one trained fish-culturist and two temporary assistants being available. Despite these handicaps and the further fact that climatic conditions during the spawning season of the black bass were unfavorable, the output exceeded last year's and the results were accomplished at a cost of $2.40 less per thousand than last year's cost, which amounted to $32.68. In arriving at this cost, salaries of the statutory employees engaged in the work were not considered.

White Sulphur Springs (W. Va.) Station

[Edw. M. Haynes, Superintendent]

The methods employed in the fish-cultural work at this station did not vary in any essential respect from those of recent years. Three species of trout were handled—brook, rainbow, and Loch Leven—and of these only the rainbow trout originated from eggs produced on the reservation. Because of the heavy mortality invariably experienced in the many attempts that have been made to hold adult brook trout through the reproductive season, it has been found advisable to restrict such work to an experimental basis. During the year all brook trout eggs handled—1,741,000—were secured either by purchase or by exchange for eggs of other species. For several years the station has accomplished quite extensive brook-trout work through cooperation with the West Virginia State authorities, the State purchasing the eggs from commercial fish-culturists and distributing the fry by means of its fisheries car. The bureau's part of the work comprises the incubation of the eggs and the care of the young fish produced until they arrive at a suitable age for liberation in open waters. Such operations during the past year involved the purchase and incubation of 1,041,000 eggs and the distribution of nearly 1,000,000 fingerling fish. Seven hundred thousand brook-trout eggs, received in exchange for those of other species, produced, in round numbers, 450,000 fingerlings. These fish were distributed by the bureau's force.

From the brood stock of rainbow trout carried in the station ponds, 1,200,000 eggs were collected, the spawning season extending from November 10 to the end of January. Of these, approximately 360,000 were shipped in the eyed stage to applicants and to other stations of the bureau. From the retained eggs more than 400,000 fingerling fish were produced and distributed, 63,000 being on hand at the close of the fiscal year. The bureau recently undertook the propagation of Loch Leven trout at this station with the view of providing a substitute for the brook trout in many of the streams of West Virginia where that species was formerly abundant but no longer thrives, owing to changed conditions. With this plan in view, 150,000 Loch Leven eggs were forwarded to the station from the Madison Valley (Mont.) field during the winter. They were of fine quality and produced a large percentage of fry. Three thousand fingerling fish, part of the results of a similar shipment in the preceding year, are being reared for a future brood stock.

An interesting and conclusive feeding experiment was conducted during the spring. A lot of 15,000 rainbow-trout fingerlings was fed on beef heart and fish meal mixed in equal proportions, while another lot, similar in every respect to the first, was maintained on a diet of beef heart solely. When undertaken it was the intention to prolong the test for 60 days, but by the end of the forty-seventh day the fish in lot 1 had become so emaciated and the daily losses were so heavy that it was necessary to abandon the experiment. In the course of the 47 days the increase in the weight of the first lot was only 5.075 pounds, and 1,721 of its number had perished. The control lot had gained 12.3 pounds and the entire loss for the period was only 288 fish. Practically no loss occurred in the first lot until the end of the thirtieth day, after which time the rate of mortality increased rapidly, and when the test was discontinued it had attained the alarming total of 250 fish per day.

Another feeding experiment was made with the view of noting its effect on the quality of the eggs obtained from the brood stock. For some time prior to the spawning season a number of adult rainbow trout were maintained on a mixture of sheep liver and cod-liver oil, while another lot was fed sheep liver alone. The results were in favor of the straight liver diet, the fish thus fed yielding a considerably larger percentage of good eggs than those subsisting on the liver and oil mixture.

The work with the warm-water pondfishes was materially hampered by cold, unseasonable weather during the spring. In an effort to obviate the loss of eggs through the sudden and extreme temperature changes to which this region is peculiarly subject, the adult largemouth bass were transferred from their winter quarters early in March to a pond supplied with a heavy flow of water, the idea being to retard the development of their eggs until all danger of extreme temperature changes would be at a minimum. This measure proved partially successful, though a severe temperature fluctuation occurring as late as May 27 injuriously affected the results.

WYTHEVILLE (VA.) STATION

[C. B. GRATER, Superintendent]

The spawning season of the rainbow trout began on October 19 and closed February 2, the yield of eggs being 965,000. The quality of the spawn was appreciably impaired as a consequence of the very low water supply available for the brood fish during the preceding spring and summer. The condition finally became so acute that it was necessary to transfer them to a series of ponds on a lower level, where more water was available. The effect of this increased flow of water of somewhat higher temperature than customary was to noticeably advance the maturity of the fish and lower the quality of their spawn. On attaining the eyed stage 201,000 of the eggs were shipped on assignment. Less than 38 per cent of the remaining stock hatched, and subsequent losses of fry in process of rearing reduced the output of fingerling fish to 129,600. Late the following May the station received a shipment of 25,000 eggs of wild rainbow trout from the Springville (Utah) field, and the 15,000 fingerlings derived from this stock were on hand at the close of June.

In order to test the efficacy of cod-liver oil and yeast in maintaining the health of fish, 300 adult rainbow trout, equally divided as to sex, were segregated in one of the ponds for some time prior to the spawning season, and were fed a diet of beef heart mixed with these materials in the proportion of 2 parts oil and 4 parts yeast to 100 parts of the heart. That the food is beneficial was clearly shown by the improved results at spawning time, the eggs from the trout used in the experiment being superior to those from the control lot (fed exclusively on beef heart), both as to quality and quantity.

The disease known as Octomitus, prevalent at this station during the two preceding years, made its appearance again, somewhat earlier than usual, and considerable numbers of fingerling fish were lost as a result of its ravages.

With the view of ascertaining the relative value of their spawn, brood rainbow trout of various ages were segregated in different ponds and their eggs developed in separate troughs. The mortality among eggs from 3-year-old and 4-year-old fish did not vary greatly, amounting to 43.3 and 43.61 per cent, respectively. The loss among the 6-year-old fish was 40 per cent, while 57½ per cent of the eggs taken from fish 7 years of age proved worthless.

In addition to its work with the rainbow trout, the Wytheville hatchery incubated 31,000 brown-trout eggs of inferior quality, the product of 900 2-year-old fish held in the station pounds, as well as 400,000 brook-trout eggs purchased from a commercial fish-culturist in Massachusetts. The latter were of an excellent quality yielding a high percentage of fingerling fish.

The outcome of the year's work in the propagation of the warm-water pondfishes was comparatively successful. Besides an output of more than 2,000 advanced fingerling largemouth black bass in the fall of 1924, 232,000 fry and No. 1 fingerling fish of that species were distributed at the close of the year, this stock being the progeny of 250 adult bass that spawned during the spring in a single large pond. The distributions also included limited numbers of rock bass, bream, and catfish.

PONDFISH-CULTURAL STATIONS

The results of the year's work at the seven main stations and five auxiliaries included in this classification were quite satisfactory, the total output exceeding that of the previous season by approximately 343,000 fish. Owing to the impossibility of obtaining an adequate stock of brood black bass, the work with that fish was considerably curtailed at some points. Following is a statement of the aggregate output of these stations, by species, during the fiscal years 1924 and 1925:

Species	1924	1925
Largemouth black bass	1, 526, 355	1, 927, 982
Smallmouth black bass	578, 385	451, 025
Sunfish	292, 525	376, 625
Crappie	40, 841	17, 671
Catfish	10, 745	17, 488
Rock bass	21, 425	21, 660
Warmouth bass	3, 945	5, 370

Cold Spring (Ga.) Station

[Chas. A. Bullock, Superintendent]

In the work of propagating the largemouth black bass it is the practice at this station to collect all brood fish at the close of a breeding season and store them in ponds until the approach of the next spawning period in February. This makes it possible to allow all the other ponds on the reservation to remain dry for approximately six months of the year, thus tending to correct any acidity of the soil, check a too abundant plant growth, and eliminate destructive beetles and other carnivorous aquatic insect life.

In advance of the spawning season steps were taken to supplement the supply of brood bass with wild adults from local waters, and a sufficient number were secured to stock three breeding ponds. Spawning began on March 20, about 10 days later than usual, the delay being due to cool weather occurring throughout January and February. There was an absence of sudden changes in temperature and heavy electrical storms while the fish were nesting, these favorable conditions, together with the improved quality of the brood stock, making possible a marked increase in production, the output for the year consisting of 400,495 fry and fingerling bass, 20,000 of which were still on hand at the end of June. The highest record previously attained in the bass work in this field was in 1893, when 271,000 were distributed.

To facilitate the work of collecting bass fry from the ponds for distribution, a decidedly novel scheme was resorted to. Every pondfish-culturist is familiar with the fact that it is very hard to locate schools of young bass in the ponds when the weather is windy. In an effort to overcome this difficulty a small quantity of menhaden fish oil was sprinkled on the surface of the pond and proved quite effectual, the water within a short time becoming smooth and quiet and remaining in that condition for about 15 minutes.

Harris Ponds (Ga.) substation.—Work in this field is confined to the propagation of bream and catfish, and while the demands for the former are constantly increasing, thus far it has been possible to keep pace with them. The ponds are drawn late in the summer and the fingerling fish transferred to the main station for convenience in distributing them to applicants.

EDENTON (N. C.) STATION

[W. S. VINCENT, Superintendent]

The enlarging and improving of the pond system at this station during the fall of 1924 enabled the bureau to produce the largest number of largemouth black bass in its history in the spring of 1925. The brood fish, obtained from local waters, were large, many of them weighing from 5 to 6 pounds, hence their ability to produce eggs was at its maximum. Several of the schools of fry were counted and were found to contain from 10,000 to 15,000 each. During May and the first part of June 155,450 advanced fry and fingerling fish were gathered from the ponds and supplied to applicants. Shortly before the middle of June the weather became so warm and the difficulty of tempering the water for the shipment of fish so great that the distribution work had to be postponed to await more favorable conditions. In addition to largemouth bass, sunfish, crappie, and warmouth bass were produced in small numbers.

LOUISVILLE (KY.) STATION

[C. W. BURNHAM, Superintendent]

The spawning season of the pondfishes handled at this station opened on April 12, about 10 days earlier than usual, eggs of the smallmouth bass being discovered on that date. In the course of the season several periods of cold weather intervened, but there was nothing to indicate that either the eggs or the fry were injured by it. The output of largemouth bass was small, as only a small brood stock of that species was available for the work. Three hundred and fifty adult fish constituted the brood stock of smallmouth bass, about one-third of which were obtained from Lake Erie with the consent of the Ohio fisheries authorities. It was originally planned to secure 300 from that source, but the demands of other stations had to be met also and the total supply was comparatively small. The season's output of young fish of this species consisted of 420,000 fry and 2,725 fingerlings.

Heretofore it has been customary, as soon as the bass were removed from the ponds, to use part of the space thus occupied for the propagation of bream. However, in view of the fact that the number of bream produced in this way exceeded the demand for them, the work with that species last season was limited to a single pond. The station also produced a small number of rock bass for distribution.

MAMMOTH SPRING (ARK.) STATION

[DELL BROWN, Superintendent]

The stock of brood smallmouth black bass on hand at the opening of spring was supplemented late in April by the acquisition of 92 adults transferred from Lake Erie waters. The fish began nesting on March 26, and spawning occurred daily for some time thereafter. It was soon discovered, however, that the nests contained very few eggs and that in every instance they were being deserted by the parent fish. The reason for this unnatural action has not been determined, but it is thought to have been caused in part, at least, by blasting operations going on at the time in the vicinity of the station. At the close of the fiscal year only 28,300 fry and fingerling bass had been produced from the entire brood stock of 416 fish.

Somewhat better results were attained in the work with the largemouth bass, though it was apparent that they, too, were greatly disturbed by the heavy explosions. Many nests were seen in the ponds, but only 20 of them contained live fry. The output from these amounted to 77,135 No. 1 fingerlings. In addition to the work with the black bass, limited numbers of rock bass, bream, catfish, and crappie were produced and distributed.

ORANGEBURG (S. C.) STATION

[G. W. N. BROWN, Superintendent]

The nesting of black bass began on February 14, earlier than in any previous year in the history of the station, and was prolonged almost to the middle of June. A very unusual occurrence—at least it has never before been noted in connection with the work here—was the breaking up of several schools of young bass before they had attained the advanced fry stage. This is believed to have been due to the severely cold weather which occurred shortly after the eggs hatched, causing the parent fish to abandon the schools. The same thing was observed at other pond stations of the bureau last season. The station's output of bass for the year consisted of 107,500 fry and 265,055 fingerlings from 1 to 4 inches in length. Deliveries were made to applicants in North Carolina, South Carolina, and Georgia, and the Edisto River at Orangeburg was stocked. In addition to the above, limited numbers of sunfish, warmouth bass, crappie, and catfish were produced and distributed to applicants.

SAN MARCOS (TEX.) STATION

[MARK RILEY, Superintendent]

Six species of fish were handled at this station, the most important being the black bass. Owing to an inadequate brood stock, both as to number and size, and to the occurrence of high winds during the height of the spring distributing season, making it impossible to capture many of the schools of young fish before they dispersed in the ponds, the output of black bass was below the average. The year's distribution amounted to 224,861 fingerlings ranging in size from No. 1 to No. 9. In addition to the station output of pondfishes, considerable numbers of black bass and sunfish were produced in Kerrville, Medina Lake, and New Braunfels, Tex., at which places the bureau is cooperating with the municipal authorities in the conduct of pondfish-cultural work.

A prolonged drought, the most enduring in the history of the State, caused the evaporation of the water in practically all ponds and tanks in the region, and even some of the larger streams were reduced to mere chains of isolated pools. Taking advantage of the opportunity offered by these conditions, the station seined the stagnant and rapidly disappearing waters and transferred the fish collected therein to running streams, thus accomplishing a larger amount of salvage work than has ever before been possible in the history of the station.

Within recent years the distributions of crappie from the San Marcos station have been considerably increased by drawing upon the stock of young crappie produced in privately owned ponds. These inclosures were originally stocked by the bureau with the understanding that the station would be allowed to draw upon them to a reasonable extent in supplying the public demands for crappie. Because of the drought and the consequent failure of this source of supply, there was a very limited output of this species during the year.

An assignment of rainbow-trout eggs, transferred from the Saratoga (Wyo.) station, and one of steelhead salmon, shipped from one of the Oregon substations, were received during the spring and incubated at Medina Lake. In each case considerable losses were sustained in the egg and fry stages, though enough survived to justify the experiment. Of the few thousands of these fish thus far planted locally, many are known to be doing well in the swift waters of the Medina River, just below the large dam.

Tupelo (Miss.) Station

[C. R. Wiant, Superintendent]

By means of stocks of wild fish obtained from local ponds and streams during the late summer and fall of 1924, the station's brood stock of large-mouth black bass was increased to 500 fish, ranging in weight from 1 to 5 pounds. At the approach of the spawning season the fish were apportioned in four ponds, according to size. Three hundred and forty of the larger ones were divided between two ponds covering an area of 2.38 acres; 110 fish, ranging from 1 to 2 pounds in weight, were installed in a pond slightly larger than two-thirds of an acre, while the remaining 50, averaging about 1 pound each, were placed in a shallow pond abundantly stocked with aquatic vegetation. Very few, if any, returns were expected from the latter pond. However, these fish and those in the pond next in size were the first to begin spawning. The segregation of the fish according to size proved of material advantage in the work, since thereby the fry came on in two periods, allowing time for the entire collection and distribution to be made by the station force, and as soon as the fry season was over in the ponds where spawning first occurred it was possible to seine them for fingerling fish without endangering the nests of the late spawners. The distribution of young bass from the four ponds during the fiscal year aggregated 430,000 advanced fry and 137,205 fingerlings.

A fairly successful season was experienced in the propagation of sunfish. The distribution of this fish was undertaken on September 9, and in the course of the fall 73,375 fingerlings were delivered, supplying 205 applicants in various parts of Mississippi and Alabama. Small distributions of crappie, rock bass, and catfish were also made.

Lakeland (Md.) Ponds Substation

[Supervised by Washington office of fish culture]

This pond system, located about 8 miles from the city of Washington, was leased by the Bureau of Fisheries in the spring of 1923. Early in the spring of 1924 two of the ponds—Nos. 1 and 3—were stocked with adult largemouth black bass obtained from the Potomac River, and a third pond, known as No. 2, was stocked with brood crappie transferred from the Edenton (N. C.) station. As a result of such stocking 47,376 black bass from 2 to 6 inches in length and 14,595 fingerling crappie were collected for distribution to applicants in the fall of 1924.

An interesting feature of the work was the growth attained by all of the fingerling fish, especially the black bass. On June 17, 1924, 3,000 No. 1 fingerling largemouth bass were transferred from pond No. 3 to pond No. 5, which has no connection with other ponds of the series. This pond was drained early in October and approximately 1,900 fish from 4 to 6 inches long were secured from it.

During the spring of 1925 the ponds were again stocked with largemouth bass and crappie, as well as smallmouth bass and bream.

CENTRAL STATION AND AQUARIUM, WASHINGTON, D. C.

[L. G. Harron, Superintendent]

The maintenance of the aquarial exhibit at central station was more than ordinarily successful, due to the decreased use of chlorine in the city water supply. During the year 1,980 specimens of fish and marine animals, representing 36 species, were on display, while in the small exhibit hatchery eggs of the brook trout, rainbow trout, whitefish, cisco, shad, and yellow perch, all of which were shipped from the bureau's stations, were incubated, and the resulting fry retained for a time. The supply of live fish was replenished as necessary from collections made at La Crosse, Wis., the Potomac River, and the Lakeland ponds. A fine display of adult brook trout and rainbow trout was received from the White Sulphur Springs (W. Va.) station, and the Bozeman (Mont.) station contributed a small number of adult grayling and black-spotted trout.

During the spring considerable trouble was experienced from the parasite *Ichthyophthirius* in the aquarium tanks, and before its ravages could be checked it occasioned a heavy loss of fish. It was finally eradicated through the use of strong solutions of lime water in the tanks, and by the end if June all surviving fish were well on their way to recovery.

Part 2.—DISTRIBUTION OF FISH AND FISH EGGS

[E. C. Fearnow, Superintendent of Fish Distribution]

The 5,301,862,583 fish and fish eggs comprising the net output of the hatcheries and rescue stations operated by the Bureau of Fisheries during the fiscal year 1925 were widely disseminated, distributions being made in practically every State in the Union, the Territory of Alaska, and the Canal Zone. Approximately 90 per cent of the output consisted of commercially important fish, such as the salmons, whitefish, pike perch, shad, yellow perch, lake trout, cod, pollock, haddock, flounder, buffalo fish, and carp. Such species are planted in waters in the vicinity of the hatcheries or near the source of egg supply, with the exception of a comparatively small number used for stocking waters where natural conditions appear to be favorable for the development of new fisheries. They are not supplied to applicants for the stocking of private waters. Under the head of commercial species are included the many food fishes annually salvaged from overflowed areas along the Mississippi River.

Among the important species propagated for stocking waters of the interior are the brook trout, rainbow trout, black-spotted trout, largemouth black bass, smallmouth black bass, rock bass, sunfish, crappie, and catfish. This branch of the bureau's work brings it into close relation with the general public, as is evidenced by the large number of applications submitted every year. In the course of the fiscal year 1925, 10,400 applications were filled and the bureau made about 1,800 plants in public waters on its own initiative, bringing the total number of assignments to 12,200, or 200 more than were made in 1924. The Izaak Walton League and various fisheries organizations during the past year submitted an unusually large number of applications, and in view of the large membership interested in the distribution of fish the allotments were liberal.

Summary, by species, of distribution of fish, fiscal year 1925

State and species	Number
Alabama:	
Catfish	3,400
Crappie	10,600
Largemouth black bass	249,375
Sunfish	94,800
Yellow perch	450
Alaska: Sockeye salmon	7,300,000
Arizona:	
Catfish	150
Steelhead salmon	23,500
Loch Leven trout	22,500
Lake trout	57,000
Brook trout	48,500
Largemouth black bass	555
Sunfish	700
Arkansas:	
Catfish	385
Rainbow trout	7,751
Crappie	5,500
Largemouth black bass	94,550
Smallmouth black bass	27,300
Rock bass	14,700
Sunfish	22,720
Yellow perch	525
California: Chinook salmon	4,042,300
Colorado:	
Rainbow trout	25,536
Black-spotted trout	751,517
Loch Leven trout	44,000
Brook trout	4,526,536

Summary, by species, of distribution of fish, fiscal year 1925—Continued

State and species	Number
Connecticut:	
Shad	500,000
Rainbow trout	8,900
Loch Leven trout	320
Brook trout	32,700
Largemouth black bass	400
Pike perch	640,000
Yellow perch	150
Delaware:	
Crappie	300
Largemouth black bass	2,561
District of Columbia:	
Shad	600,000
Rainbow trout	1,500
Georgia:	
Catfish	4,700
Steelhead salmon	18,680
Rainbow trout	21,000
Brook trout	19,000
Crappie	50
Largemouth black bass	224,865
Rock bass	2,200
Sunfish	57,613
Idaho:	
Catfish	60
Chinook salmon	2,117,500
Rainbow trout	1,416,300
Black-spotted trout	167,000
Lake trout	1,600
Brook trout	35,850
Graylings	4,877,029
Illinois:	
Catfish	347,550
Buffalo fish	235,500
Carp	709,975
Rainbow trout	5,000
Pike and pickerel	11,745
Crappie	1,811,866
Largemouth black bass	15,721
Sunfish	510,455
Miscellaneous fishes	479,536
Indiana:	
Catfish	5,570
Carp	125
Rainbow trout	8,600
Brook trout	53,500
Crappie	8,025
Largemouth black bass	10,410
Smallmouth black bass	119,500
Rock bass	100
Sunfish	13,550
Yellow perch	3,125
Iowa:	
Catfish	4,323,042
Buffalo fish	2,498,600
Carp	2,187,750
Rainbow trout	18,804
Loch Leven trout	2,000
Brook trout	31,250
Pike and pickerel	55,193
Crappie	1,714,399
Largemouth black bass	39,305
Smallmouth black bass	500
Sunfish	1,559,652
Pike perch	299
Yellow perch	47,890
White bass	360
Miscellaneous fishes	1,417,409
Kansas:	
Catfish	600
Crappie	600
Largemouth black bass	2,200
Rock bass	200
Sunfish	11,900
Kentucky:	
Largemouth black bass	1,900
Smallmouth black bass	166,500
Rock bass	575
Sunfish	11,500
Louisiana:	
Catfish	675,000
Buffalo fish	13,142,100
Carp	651,000
Pike and pickerel	995
Crappie	227,300
Largemouth black bass	11,085
Sunfish	98,600
Yellow perch	100
White bass	100
Miscellaneous fishes	403,600
Maine:	
Atlantic salmon	1,422,500
Landlocked salmon	970,880
Rainbow trout	1,200
Loch Leven trout	480
Lake trout	30,450
Brook trout	1,172.148
Smallmouth black bass	6,095
Winter flounder	1,884,436,000
Maryland:	
Shad	8,967,602
Rainbow trout	24,800
Loch Leven trout	2,100
Brook trout	108,350
Crappie	2,268
Largemouth black bass	4,570
Rock bass	4,475
Sunfish	11,300
Yellow perch	17,212,245
Massachusetts:	
Steelhead salmon	28,080
Landlocked salmon	11,000
Rainbow trout	45,355
Brook trout	136,500
Mackerel	2,517,000
Smallmouth black bass	9,700
Cod	462.712,000
Haddock	24,511,000
Pollock	222,890.000
Winter flounder	728,500,000
Michigan:	
Catfish	6,500
Whitefish	26,850,000
Steelhead salmon	40,500
Landlocked salmon	10,000
Rainbow trout	100,800
Lake trout	28,426,500
Brook trout	1,054,720
Crappie	3,325
Largemouth black bass	11,030
Smallmouth black bass	11,925
Sunfish	10,115
Pike perch	2,600,000
Yellow perch	1,650
Minnesota:	
Catfish	2,882,560
Buffalo fish	95,245
Carp	3,438,015
Steelhead salmon	24,000
Rainbow trout	90,355
Loch Leven trout	15,500
Lake trout	2,241,500
Brook trout	182,800
Pike and pickerel	80,079
Crappie	9,208,698
Largemouth black bass	119,203
Sunfish	8,976,865
Pike perch	1,341,285
Yellow perch	167,505
White bass	1,865
Fresh-water drum	14,590
Miscellaneous fishes	93,500
Mississippi:	
Catfish	200
Crappie	11,000
Largemouth black bass	520,035
Rock bass	150
Warmouth bass	538
Sunfish	41,975

Summary, by species, of distribution of fish, fiscal year 1925—Continued

State and species	Number
Missouri:	
Catfish	9, 145
Rainbow trout	148, 852
Crappie	9, 275
Largemouth black bass	37, 720
Rock bass	2, 800
Sunfish	70, 742
Yellow perch	564
Montana:	
Catfish	360
Rainbow trout	635, 000
Black-spotted trout	1, 497, 000
Loch Leven trout	113, 711
Lake trout	7, 500
Brook trout	987, 460
Crappie	50
Largemouth black bass	2, 600
Sunfish	330
Yellow perch	600
Nebraska:	
Catfish	300
Rainbow trout	34, 850
Brook trout	81, 250
Largemouth black bass	2, 278
Nevada:	
Rainbow trout	30, 000
Brook trout	31, 500
Crappie	2, 200
Sunfish	2, 250
New Hampshire:	
Landlocked salmon	6, 400
Rainbow trout	78, 150
Loch Leven trout	800
Lake trout	9, 500
Brook trout	422, 208
Largemouth black bass	3, 780
Smallmouth black bass	9, 000
Pike perch	660, 000
New Jersey:	
Rainbow trout	3, 000
Brook trout	1, 500
Crappie	225
Largemouth black bass	4, 620
Smallmouth black bass	600
Sunfish	225
New Mexico:	
Catfish	225
Rainbow trout	400
Black-spotted trout	41, 300
Brook trout	46, 500
Crappie	870
Largemouth black bass	1, 325
Rock bass	350
Sunfish	2, 600
New York:	
Whitefish	36, 700, 000
Cisco	118, 900, 000
Landlocked salmon	17, 240
Rainbow trout	38, 345
Lake trout	277, 000
Brook trout	624, 700
Crappie	1, 400
Largemouth black bass	2, 790
Smallmouth black bass	92
Pike perch	6, 500, 000
Yellow perch	4, 400, 000
Winter flounder	24, 115, 000
North Carolina:	
Shad	480, 000
Glut herring	92, 000, 000
Steelhead salmon	8, 350
Rainbow trout	45, 800
Loch Leven trout	6, 890
Brook trout	286, 700
Crappie	2, 165
Largemouth black bass	181, 830
Smallmouth black bass	225
Rock bass	17, 250
Warmouth bass	20
Sunfish	19, 090
Yellow perch	1, 000, 331
North Dakota:	
Catfish	10, 650
Crappie	14, 900
Largemouth black bass	3, 280
Sunfish	10, 000
Ohio:	
Catfish	627
Buffalo fish	6, 870
Carp	31, 500, 000
Whitefish	109, 080, 000
Rainbow trout	150
Brook trout	4, 000
Crappie	3, 450
Largemouth black bass	9, 470
Smallmouth black bass	223, 088
Sunfish	13, 380
Pike perch	63, 140, 000
Yellow perch	19, 969, 200
Oklahoma:	
Catfish	1, 170
Crappie	3, 310
Largemouth black bass	7, 610
Rock bass	900
Sunfish	24, 150
Oregon:	
Chinook salmon	10, 828, 000
Silver salmon	2, 081, 000
Sockeye salmon	46, 700
Steelhead salmon	474, 000
Landlocked salmon	9, 100
Brook trout	65, 000
Silver trout	100, 000
Pennsylvania:	
Catfish	3, 684
Steelhead salmon	292
Rainbow trout	187, 550
Loch Leven trout	54, 900
Brook trout	753, 474
Crappie	12, 215
Largemouth black bass	12, 810
Smallmouth black bass	6, 000
Rock bass	300
Sunfish	11, 170
Yellow perch	100
Rhode Island: Largemouth black bass	2, 000
South Carolina:	
Catfish	225
Rainbow trout	32, 600
Brook trout	23, 250
Crappie	50
Largemouth black bass	340, 240
Rock bass	1, 000
Warmouth bass	110
Sunfish	11, 240
South Dakota:	
Catfish	3, 000
Steelhead salmon	54, 600
Rainbow trout	52, 850
Loch Leven trout	347, 400
Brook trout	860, 900
Crappie	4, 150
Largemouth black bass	6, 000
Sunfish	3, 200
Yellow perch	810
Tennessee:	
Steelhead salmon	462
Rainbow trout	80, 912
Loch Leven trout	1, 040
Brook trout	33, 400
Crappie	800
Largemouth black bass	81, 350
Rock bass	2, 100
Sunfish	1, 400
Texas:	
Catfish	8, 140
Steelhead salmon	2, 800
Crappie	700
Largemouth black bass	298, 613
Smallmouth black bass	1, 000
Rock bass	85

Summary, by species, of distribution of fish, fiscal year 1925—Continued

State and species	Number
Texas—Continued.	
Warmouth bass	3,425
Sunfish	103,010
Utah:	
Catfish	600
Rainbow trout	416,050
Black-spotted trout	56,000
Brook trout	359,300
Vermont:	
Steelhead salmon	13,200
Landlocked salmon	11,826
Rainbow trout	500
Lake trout	171,378
Brook trout	497,971
Smallmouth black bass	5,802
Pike perch	31,900,000
Yellow perch	24,200,000
Virginia:	
Catfish	1,282
Shad	6,611,069
Rainbow trout	142,250
Loch Leven trout	2,450
Brook trout	175,150
Crappie	2,900
Largemouth black bass	313,440
Rock bass	13,375
Sunfish	13,165
Yellow perch	17,208,845
Washington:	
Chinook salmon	28,225,200
Chum salmon	16,051,650
Silver salmon	11,894,289
Sockeye salmon	24,615,000
Humpback salmon	10,892,500
Steelhead salmon	763,300
Rainbow trout	16,000
Washington—Continued.	
Black-spotted trout	24,000
Brook trout	147,800
West Virginia:	
Rainbow trout	169,725
Loch Leven trout	74,650
Brook trout	895,600
Crappie	1,425
Largemouth black bass	5,125
Sunfish	950
Wisconsin:	
Catfish	6,020,040
Buffalo fish	845,615
Carp	3,972,600
Rainbow trout	271,100
Loch Leven trout	37,800
Lake trout	1,910,000
Brook trout	1,197,000
Pike and pickerel	561,065
Crappie	3,820,235
Largemouth black bass	119,775
Sunfish	2,154,380
Pike perch	9,460,000
Yellow perch	330,050
White bass	2,100
Fresh-water drum	5,000
Miscellaneous fishes	1,302,450
Wyoming:	
Catfish	825
Rainbow trout	156,000
Black-spotted trout	3,824,100
Loch Leven trout	57,800
Brook trout	635,580
Largemouth black bass	5,700
Sunfish	1,920

METHOD OF DISTRIBUTION

Upon receipt of a request for fish, the bureau furnishes a blank form calling for a complete description of the waters to be stocked. After it has been properly filled out and returned, with the indorsement of a Member of Congress, the bureau endeavors to assign a suitable species of fish to be delivered as soon as a supply is available. As the information given on the application is used as a basis for determining what species should be assigned, applicants should endeavor to give as accurate descriptions as possible.

Applicants should confine their choice of fish to species that are indigenous to the waters of the region concerned. Many of the State fish and game authorities have requested that all applications for nonindigenous or predacious fishes be submitted to them for consideration, a policy with which the bureau is in full accord, and all such applications, including those for carp, are referred to the proper State officials before they are accepted. Even with the State's approval, the bureau reserves the right to exercise its own discretion in allotting fish.

Every species of fish reproduces at a particular season of the year. Brook trout and the domesticated rainbow trout spawn in eastern waters in the fall or early winter; the black-spotted trout, steelhead, and wild rainbow trout of western waters spawn in the spring, while all of the so-called warm-water pondfishes do so in the spring or early summer.

With the exception of a comparatively few brook and rainbow trout, which are held until they have attained the fingerling, or yearling stage, each species is distributed as soon as the fish have attained a suitable size for shipment; and after a season's supply has been exhausted no more are available for a year. In the Eastern States, trout are distributed between March and the last of June, while in the Rocky Mountain States the distribution usually begins in July and extends to about October 1.

The basses, bream, and other pondfishes are distributed within from one week to several months after they are hatched, the last lots of bass shipped usually ranging from 4 to 6 inches in length, while the sunfish range from 2 to 4 inches long. Such commercial species as the whitefish, cod, and pike perch, which are hatched in great numbers, are necessarily distributed as fry.

Immediately upon the receipt of a request, the applicant is notified concerning the species assigned him and as to the approximate date when the fish can be delivered. Just prior to the shipment a second notice is sent, usually by wire, stating the exact time the fish will arrive at the railroad station named in the application. On account of the comparatively heavy cost of shipping fish to distant points, such trips are postponed until a sufficient number of applications from a given section have accumulated to warrant the expense of making a shipment.

In making a distribution, the fish are usually sent out in the bureau's fisheries cars which are stationed at some central railroad point in a given section, while deliveries by messengers are made to applicants living at some distance off the main line. The messengers travel in the baggage cars of regular passenger trains and deliver the fish at destination as the train makes its regular stops. Delivery is made to the applicant's railroad station without expense to him, but he is required to furnish containers for transporting the fish to the waters to be stocked. The bureau's cans can not be lent for this purpose, since the cars and messengers must proceed at once to other points.

DISTRIBUTION OF FISHES OF INTERIOR WATERS

CAR NO. 3

[E. R. Widmyer, Captain]

The distribution of warm-water fishes from the La Crosse (Wis.) substation was taken up on July 12, and between that time and the close of the Mississippi River operations on the 4th of December, 266,185 fingerling fish were delivered to applicants, the work involving both car trips and messenger shipments and extending into the States of Wisconsin, Minnesota, Iowa, Ohio, Illinois, North Dakota, and South Dakota. Early in January the car was placed in the shops of the Chicago, Milwaukee & St. Paul Railway Co. at Milwaukee, Wis., and while undergoing annual repairs an electrically driven air compressor was installed.

For the purpose of relieving overcrowded conditions in the La Crosse hatchery during the latter part of March, the car transferred 153,000 rainbow trout from La Crosse to Lynxville, Wis. On April 1 it carried a load of trout from La Crosse to Homer, Minn., and after

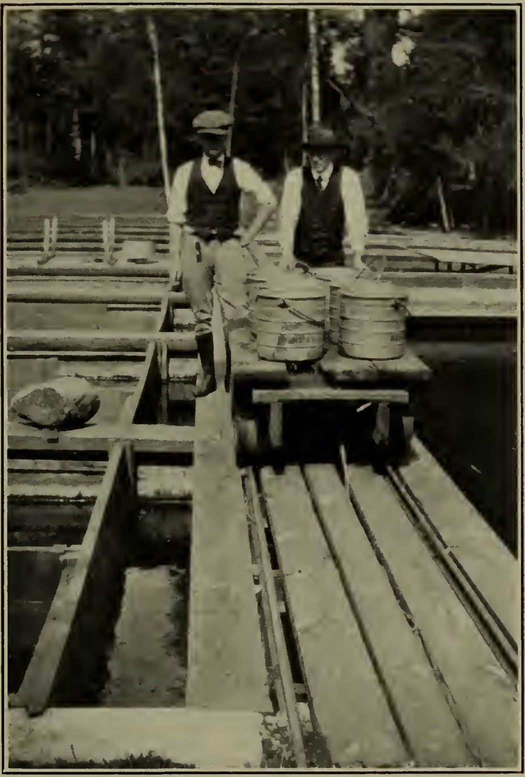

FIG. 7.—Hauling fish on a hand car, Cedar Island Lodge, Brule, Wis.

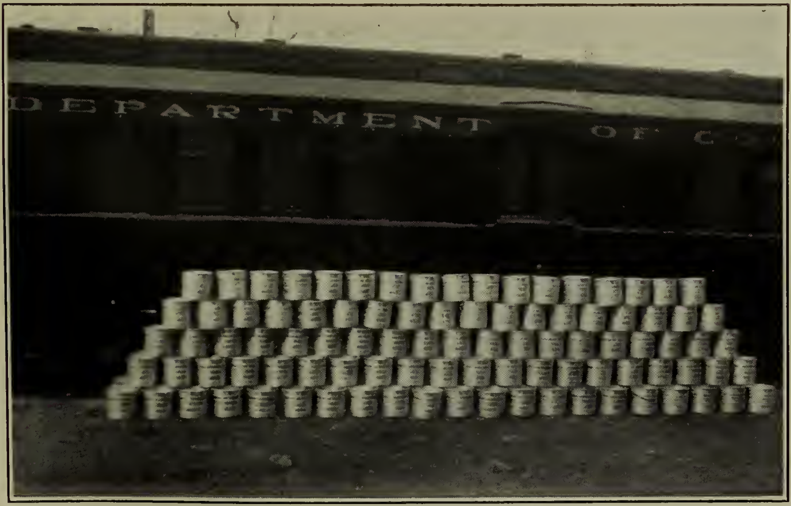

FIG. 8.—Transportation equipment of car No. 3

making a shipment of trout from that point to Eau Claire, Wis., it proceeded to Duluth to take up the season's distribution of whitefish, pike perch, and trout from the Duluth station. This work was in progress from April 26 to June 20 and included the shipment 1,100,000 whitefish, 13,000,000 pike perch, and 10,848,500 lake trout, all in the fry stage, as well as 189,000 fingerling brook trout and 29,000 steelhead-salmon fingerlings.

In moving truckloads of fish from the hatchery to the railroad station and boat wharves care was taken to avoid carrying only partial loads, and the shipment of the fish was so planned that in transporting several species to a given section the work might be accomplished without duplication of trips except in cases where very heavy consignments were to be delivered. One messenger carried 60 pails of brook trout in a single baggage-car shipment. The very successful and economical results attained in this distribution work were made possible in large measure by the close cooperation afforded by the Chicago, Milwaukee & St. Paul and the Minneapolis, St. Paul & Sault Ste.Marie Railway Cos.

During the fiscal year ended June 30, 1925, Car No. 3 traveled 11,742 miles and delivered 25,166,500 fish.

CAR NO. 4

[JAMES L. GARDNER, Acting captain]

At the opening of the fiscal year Car No. 4 was engaged in the shipment of black bass from the Lakeland (Md.) ponds, and during the first week in July it distributed from these ponds 12,200 fingerling fish. On July 7 the car was ordered to the White Sulphur Springs (W. Va.) station to make carload shipments of trout to Elkins, W. Va., and Williamsport, Pa. On the completion of this work it proceeded to La Crosse, Wis., to assist in the distribution of miscellaneous river fishes from the upper Mississippi River rescue stations. In connection with this work the car made trips to Watersmeet, Mich., Green Bay, Wis., Fort Wayne, Ind., and Harrisburg, Pa., returning from the latter point to Washington, D. C. In its work in the rescue field the car transported 87,745 fingerling and adult fish.

During October the car distributed from the Lakeland (Md.) ponds 46,420 miscellaneous pondfishes ranging in size from fingerlings to adults, and from the White Sulphur Springs (W. Va.), station it distributed 31,000 brook and Loch Leven trout. During the months of November and December it was stationed at Washington, D. C., where it was used as living quarters for the car-service employees on detail in the Washington office of the bureau.

On January 6 the car was taken to the plant of the American Car & Foundry Co. at Wilmington, Del., for annual repairs. On the completion of this work, late in January, it returned to Washington and was again used as living quarters for its crew until the middle of March, when it proceeded to Wytheville, Va., and received a load of 150,250 fingerling trout. Returning on March 26 to Washington, the car made plants of fish en route and by messenger shipments on its arrival there. Soon afterward it left for Erwin, Tenn., and took up the distribution from the hatchery at that point, making nine carload trips and a number of detached messenger shipments and carrying a total of 532,727 trout, bass, and bream for delivery to applicants in

Tennessee, Virginia, North Carolina, South Carolina, Georgia, and Pennsylvania. The shipment of fingerling black bass, rock bass, and bream in connection with the trout distribution effected a considerable saving of funds.

On May 8 the car arrived at White Sulphur Springs, W. Va., where it received 54,950 fingerling trout for distribution to applicants in central Pennsylvania. From Pennsylvania it proceeded to Bucksport, Me., via Nashua, N. H., receiving at Nashua 60,940 trout and landlocked salmon for delivery to applicants in the southwestern section of Maine. It arrived at Bucksport on May 23, and took up the distribution from the Craig Brook (Me.) station on May 27. Four carload trips and a number of detached messenger shipments with brook trout and landlocked salmon were made, also six carload trips with Atlantic salmon. In the course of the work from this station the car and its messengers covered practically all of the State of Maine and distributed a total of 3,202,145 salmon and trout.

During the year the car traveled 14,266 miles, made 32 trips, delivered or planted 4,188,801 fish, and filled 1,500 applications.

CAR NO. 7

[E. M. LAMON, Captain]

Car No. 7 was engaged in the shipment of fish from the upper Mississippi River collecting stations between September 29 and the end of November, during which time it distributed 114,100 bass and miscellaneous fishes suitable for pond culture to applicants in Wisconsin, Michigan, Iowa, Pennsylvania, Kentucky, Mississippi, Alabama, and Nevada. At the close of the rescue work the crew of the car was detailed for duty during the winter at fish-cultural stations of the bureau, and in February it was placed in the shops of the Chicago, Milwaukee & St. Paul Railway Co. for annual repairs. In the course of this work it was outfitted with an electrically driven air compressor, which has given such satisfaction that except in times of emergency the use of the steam-driven compressor can be entirely dispensed with and a considerable saving in fuel effected thereby.

About the middle of April the car took up the distribution of trout from the Manchester (Iowa) station, leaving there on April 16 with a load of fish for applicants in northern Wisconsin. After completing this trip the car obtained a load of 300,000 brook trout from the Cedar Island Lodge hatchery at Brule, Wis., and distributed them to applicants in the vicinity of Fond du Lac, Wis. It then proceeded to La Crosse, and between April 25 and May 16 distributed from the hatchery at that point 497,800 brook trout, 51,900 Loch Leven trout and 177,100 rainbow trout, delivering them to applicants in Wisconsin and Minnesota.

On completion of the La Crosse distribution the car resumed its work from the Manchester station, making carload shipments of trout to Madison and Milwaukee, Wis. It then obtained 40,500 young rainbow trout from the Lincoln Park Aquarium at Chicago, Ill., and distributed them in Wisconsin. Returning to Manchester it made a trip with trout to Minocqua, Wis., and then proceeded to Dubuque, Iowa. About this time the work at Manchester was brought to an abrupt close, the destructive flood which occurred on the night of

June 14 liberating all fish on hand at the station. On June 28 the car left Dubuque to take up the distribution of trout from the Bozeman (Mont.) station.

Car No. 7 traveled 11,335 miles in the course of the fiscal year, made 16 trips, and distributed 1,905,800 fingerling fish.

CAR NO. 8

[E. K. Burnham, Captain]

During the fiscal year 1925 this car distributed fish from stations located at Neosho, Mo., Langdon, Kans., and Leadville, Colo., and assisted in the shipments from the upper Mississippi River field. In connection with its work it entered 10 States, traveled 9,615 miles, made 18 carload trips over 8 trunk-line railroads, and distributed 2,627 cans of fish to 471 applicants. The numbers and species of fish handled in its work are shown in the following table:

	Fingerlings	Yearlings		Fingerlings	Yearlings
Brook trout	2,603,000		Crappie	6,000	
Rainbow trout		3,200	Bream	51,300	
Black-spotted trout	549,000		Yellow perch		45
Steelhead salmon	22,500		Catfish	5,098	
Lake trout	51,000		Rock bass	1,300	600
Loch Leven trout	38,500				
Black bass	11,230		Total	3,338,928	3,845

In January this car was placed in the shops of the Denver & Rio Grande Western Railroad Co., at Denver, Colo., for annual repairs, which consisted of painting the exterior surface, generally overhauling its trucks, and installing a hard-maple floor throughout. The crew made minor repairs to the interior of the car, changing its air, steam, and water pipe systems so that an even pressure might be maintained in all cans of fish. Its piping was also made self-draining to minimize the danger from freezing, and its capacity was increased to carry 20 additional fish pails, making its normal load 120 pails and seventy 10-gallon cans.

CAR NO. 9

[H. F. Johnston, Captain]

The distribution work of this car for the fiscal year 1925 began on July 22, when it left the Homer (Minn.) station with a miscellaneous load of river fishes for delivery to applicants in Nebraska, Wyoming, and Montana, en route to its destination at Bozeman, Mont. The distribution work from the Bozeman station extended from July 28 to October 13 and included the shipment of 1,609,710 trout of five species and their delivery in three States.

The annual repairs to this car were made in February by the American Car & Foundry Co. at Wilmington, Del., and included numerous changes, the more important being the rearrangement of the dining room and the construction of lockers for the storage of the aerating equipment when not in use. The covers of the lockers were upholstered, making very comfortable seats. During the month of March the crew changed the aerating apparatus to handle 250

Fearnow pails, which number was added to the carrying equipment of the car.

Between April 1 and June 25 this car was occupied in distributing trout from the Wytheville (Va.) and White Sulphur Springs (W. Va.) stations and in rendering assistance to the State of Maryland. These distributions were made in Pennsylvania, Virginia, West Virginia, Maryland, and New York.

In consequence of a 12-hour delay en route from the White Sulphur Springs station with a full load of trout, and later on for a period of 8 hours with half a load, the electrically driven air compressor of this car was in continuous operation without weakening the batteries to any appreciable extent. This practical test demonstrates that it will seldom be necessary to use the steam-controlled air compressors.

In the course of the year car No. 9 traveled 22,825 miles, making 31 trips and supplying 1,173 applicants. It entered 11 States and carried a total of 2,933,568 trout and 29,588 miscellaneous river fishes.

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